April 1961

Electrical South

a W.R.C. Smith Publication

A co[illegible]lectrical installation provides the proper illumination levels for a photographer's color work

In this issue:

Wiring workshop unveiled at annual wiring sales meeting

Designs for low ground resistance at substations

Utility engineering section begins on page 61

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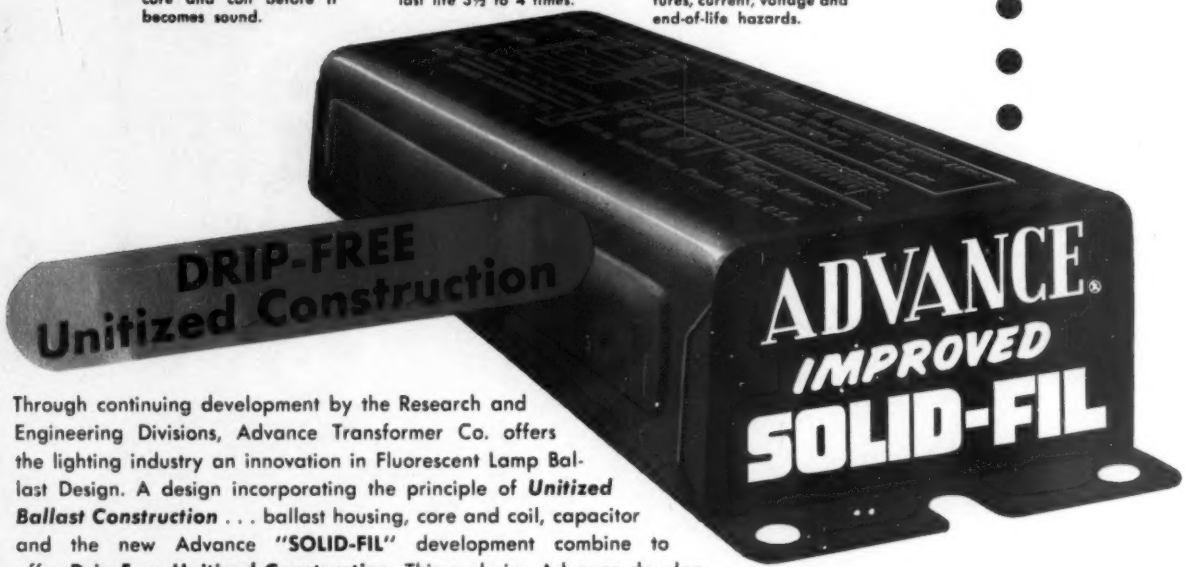

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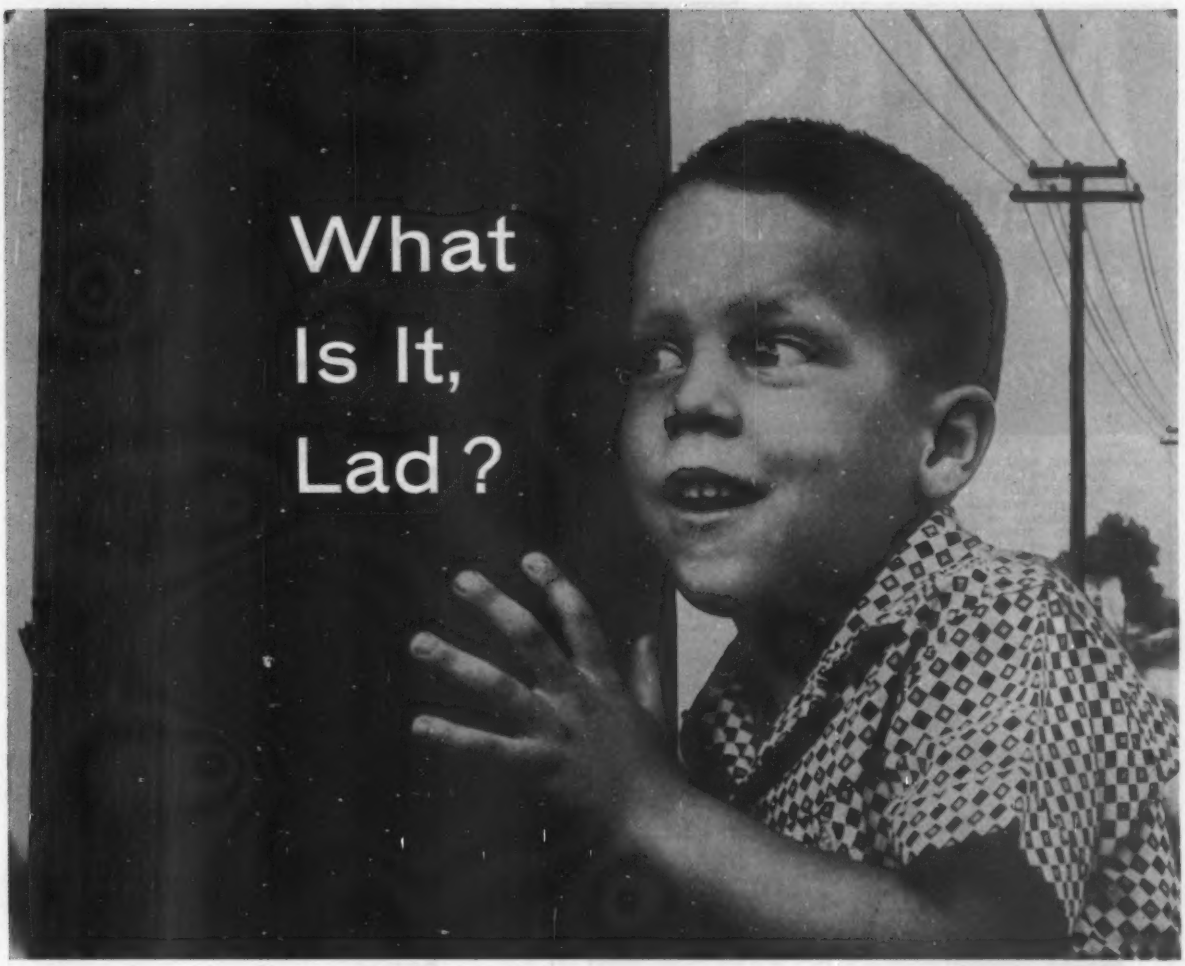

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FRONT COVER—In Dallas a contracting firm was given the job of increasing service for existing and future needs in a recently enlarged photography studio. How this was accomplished is described in a story beginning on page 36.

Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Unemployment data

One of the most perplexing economic issues today is the apparent conflict of the national employment and unemployment figures.

Statistics recently released showed that the United States had a record employed labor force of 64,655,000 persons. At the very same time, February's unemployment total reached 5,705,000, the highest figure since 1941.

Thus, as of the close of February, this nation saw approximately eight per cent of its potential work force out of employment, for the time being at least. This column has indicated several times in the past that there is a problem of chronic unemployment which this nation faces that has been increasing in intensity.

There is little doubt but that there will always be a growing number of unemployed in the foreseeable future, possibly in the neighborhood of three per cent of the total labor force.

Chronic unemployment is generally conceded to be the result of a growing dynamic economic society and is enhanced by changes in production techniques (such as automation), by changes in product needs (through registering different consumer tastes and desires), and by growing population (with the labor force increasing at a rate faster than industry can provide new and valuable jobs).

There are also a moderate number of "unemployables" who for one reason or another cannot be assimilated into the labor force. The best hope of minimizing a bad unemployment picture is to work toward the eventual control of the first factors mentioned.

Changes in production techniques do contribute temporarily to the unemployment picture. However, the effect is short-run, and the economic advances occasioned by the new method or technique should trigger greater than ever job opportunities in a competitive society.

These advances have been present in increasing numbers during the past two decades and have generally worked toward over-all increased prosperity.

The American people have always been vitally interested in new and better products that might increase their standard of living and consequent enjoyment of life. By nature, this quest for better things tends to make some products obsolete in very quick fashion. Where such changes occur, there will be dislocation of production and employment until new products are created that whet the consumers' desires.

The third factor, and probably the currently most serious, is the "population explosion" concept that sees an increasing population placing more and more people into the work force before they can be put into productive work. This situation cannot be overcome promptly and requires planning both by managers in private industry and representatives of government service.

There is no reason to believe that they cannot in time find productive employment opportunities because, although the population increase created the problem, it has also created a sizable new market for consumer goods. This, in turn, requires new factories and plant facilities and more labor to man them.

Thus, the one real hope for the permanent reduction of the current heavy unemployment figures is the prompt development of new job opportunities through a vigorous private business expansion—and not from a series of government stopgap operations.

The latter can ease temporary suffering and thus may be utilized, but they are not the real cures for a sick economy.

Retail trends

Optimism in economics in this country will be touched off primarily by weather conditions. The effect of snow, ice, heavy rains, and a rash of prespring tornadoes upon retail sales has been great this year, and the nation's retailers watch the climatic trends very carefully to see if they can develop a resurgence of consumer buying.

There is no doubt but that sales in many retail fields have been seriously hampered during the past month by the steady procession of winter storms. In the Southland where weather might be expected to have moderated considerably in February and early March, heavy rainstorms and subsequent flooding ruined chances for heavy consumer buying.

An early Easter, moreover, could have relatively little sales appeal if weather conditions remained inclement on into April. During the second week of March, it appeared as if the weather would moderate in many areas of the United States, and the question of whether consumers would buy or not in face of the publicized recession stories became of paramount interest.

Preliminary reports are good, and it would appear that Easter sales may yet establish figures of record proportions. Department stores in many sections indicate strong consumer demand for clothes and the necessary fashion accoutrements.

Home building, aided by greater mortgage money availability, shows some sign of improvement and may even achieve record results. Only the automobile industry remains relatively quiet.

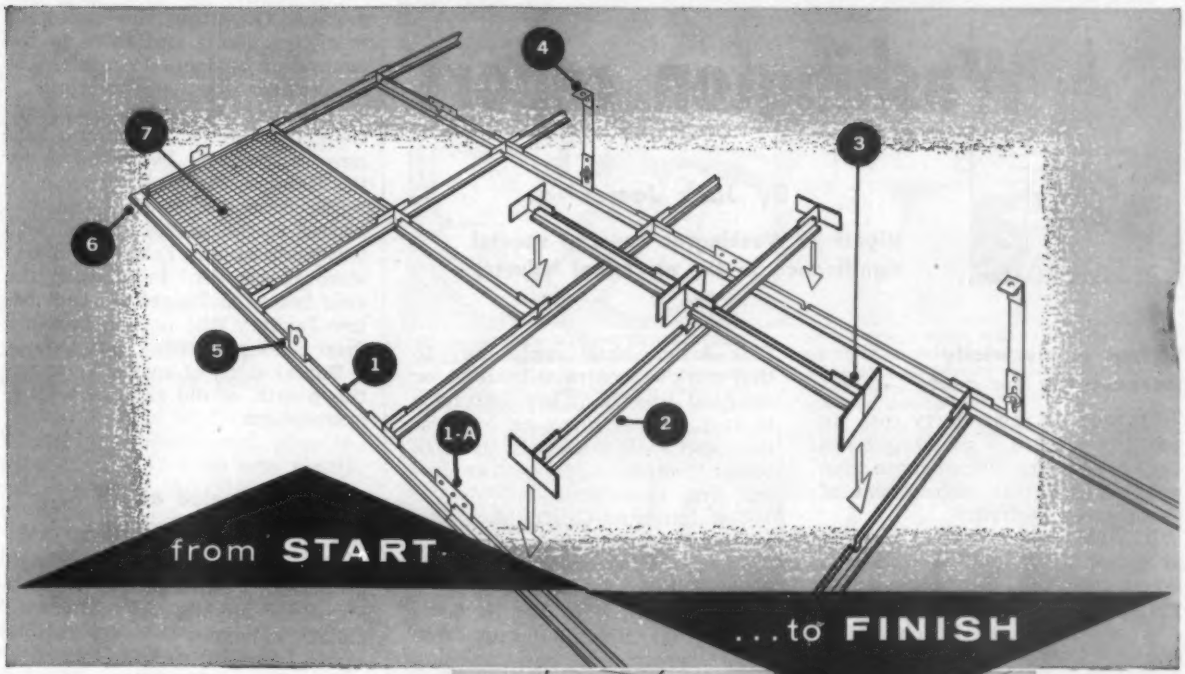
Automobile sales

It is indeed reassuring to see and hear reports of surveys reporting a heavy prospective demand for new automobiles in 1961. Up to this point, however, this demand has not been accompanied by the offer of purchasing power, and the nation's automotive producers have resorted to curtailed production schedules and personnel layoffs.

It is quite possible that the inclement weather conditions have dampened the enthusiasm of new car buyers and that they will appear in the market place along with the spring sunshine.

(Continued on page 131)

Dr. Bunting is a well-known economist and educator having special knowledge of the South.



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Washington report

By Jack James

Digest of Washington news of special significance to the electrical industry

Output of electricity increases six per cent

OUTPUT OF ELECTRICITY rose six per cent in 1960 — rounding out a decade in which output more than doubled, the U.S. Department of Commerce reported.

In 1959 the electric industry produced 795 billion kilowatt hours; in 1960, 840 billion; ten years before, 389 billion.

What this surge in electricity output meant to the country was described in general terms by the Department: "New types of goods and services, unknown at the beginning of the century, have come to constitute an increasingly important portion of the total output.

"These new goods and services could not be produced by any amount of labor or animal power unassisted by the development of energy-operated equipment."

Secondary boycott pact strike declared illegal

A STRIKE by the members of the AFL-CIO Building and Construction Trades Council at Monroe, La., to force contractors and subcontractors to sign a secondary boycott agreement, has been declared illegal by a trial examiner for the National Labor Relations Board.

Contractors have the right to sign voluntarily, he said. But they cannot be forced.

The agreement that the union council sought would have prevented subcontracting to non-union subcontractors. It read:

"The contractor shall not sublet, subcontract, or assign any of the work which comes under the jurisdiction of the Council or its member local unions to any persons, firm, or corporation, unless such person, firm, or corporation agrees in writing to abide by the Master agreement and the Craft agreement covering such work. This Article shall apply only to that work subcontracted, sublet, or assigned directly by the contractor to such person, firm, or corporation, and shall not apply to work subcontracted . . . to another person, firm, or corporation."

The Landrum-Griffin Act permits contractors and unions to sign such agreements. But when Senator John F. Kennedy wrote the Landrum-Griffin Act, he made it clear that unions could not force these agreements on unwilling contractors.

Journeymen electricians earn top pay in building

TO THE MEN who maintain and install the electric lines, the nation's demand for electric power has been a blessing.

Commerce Department figures show that the journeymen electricians in the U.S. are the highest paid journeymen in the building and construction trades. During November they grossed an average of $148.54 a week.

Other skilled journeymen ranged between $114 and $130.

Pay for skilled electricians has shot up. Five years ago they averaged $116.52 a week.

The number of electricians, also, has risen. It went up about six per cent in the 12-month period ending last November; 200,000 electricians were employed that month.

Housing starts decline, no early upturn in view

CONTRACTORS STARTED work on 125,000 fewer houses in the second half of 1960 than the first.

The decline occurred despite the increase in the supply of mortgage money and the slight easing of financing costs.

The Census Bureau, which keeps the nation's housing statistics, foresees little if any pickup in housing starts in the next few months. Offsetting the easing of mortgage credit and rates is the continuing business downturn that discourages new homebuilding.

Because of budgetary considerations, the Bureau expects no bold new program to be proposed by the Kennedy Administration.

The drop in housing starts that started in the second half of 1960 was continuing in February. Starts were 12 per cent lower than the year before and eight per cent below January (the normal monthly drop is six per cent).

But as signs of spring appeared this month, so did signs of a business upturn.

Criticism leveled at AF for holding up payments

A HOUSE SUBCOMMITTEE on Appropriations blistered the U.S. Air Force for holding up millions of dollars in payments to contractors and subcontractors — including electrical subcontractors at the vast Cape Canaveral complex — who are working on America's vital missile program.

Text of secret testimony was released last month. By holding up on payments for months, the Air Force pushed some contractors to the verge of bankruptcy, according to testimony.

Rep. Harry R. Sheppard, chairman of the subcommittee, said that the Air Force is jealous of the Army Corps of Engineers. The Corps supervises the Air Force's construction work. The Air Force would delay payments for months until it could O.K. work previously O.K.'d by the Army Engineers.

IBEW three-step plan helps strike prevention

THE IBEW JOINED 17 other AFL-CIO Building and Construction Trades unions in a plan with the National Constructors Association to prevent strikes and lockouts.

The National Constructors Association is composed of 28 of the nation's largest construction and engineering firms.

The plan supplements grievance and arbitration procedures in existing contracts. It does not replace them. Nor does it replace the National Joint Board for the Settlement of Jurisdictional Disputes.

Here is how the plan works:

First step: attempt by local contractor and union representatives to settle problem. Second step: na-

tional representatives of union and contractor make settlement try. Third step: arbitration if provided for in existing contract; if not, then a strike or lockout could occur; but the contractor and union can agree voluntarily to arbitrate.

The plan sets up a National Arbitration Board with three contractor representatives, three union representatives, and a neutral.

Construction may drop slightly during the year

CONSTRUCTION MAY FALL slightly in 1961. Businessmen plan to spend $34½ billion on new plants and equipment this year. That is three per cent less than in 1960.

But for the electric industry — growing at a rate of six per cent a year — this does not presage an actual reduction in the amount of work; rather, a slightly lower rate of growth. And possibly not even that, as businessmen are continuously using more and more electricity to do the work of muscles.

According to the Commerce Department, "Businessmen anticipate that the decline in investment, which began in the third quarter of 1960, will continue through the second quarter of this year. Present plans for 1961 point to a mild increase in capital expenditures in the latter half of the year."

Southern population climbs 125 per cent

THE SOUTH HAS GAINED more population than any other section of the country in the last 60 years. It has had the second highest rate of growth. This is the report by the Census Bureau.

In 1900, 24.5 million people lived in the South. In 1960, there were 55 million. In 1950, there were 47.2 million.

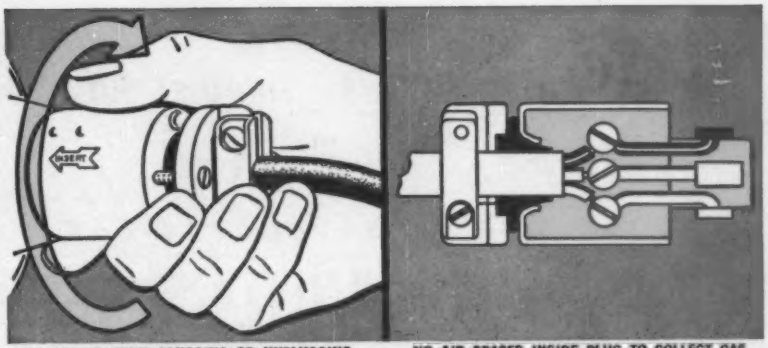
Only the West has grown faster than the South.

US Labor Department pushes safety training

THE LABOR DEPARTMENT is launching a plan to put safety training into all apprentice training programs. Pilot projects are underway throughout the country.

Cooperating with state and local apprenticeship bodies, the Depart-

(Continued on page 132)



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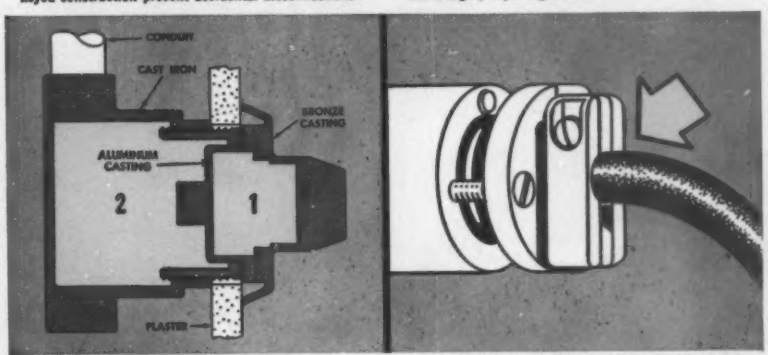

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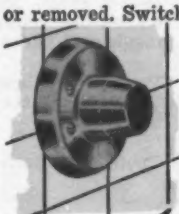

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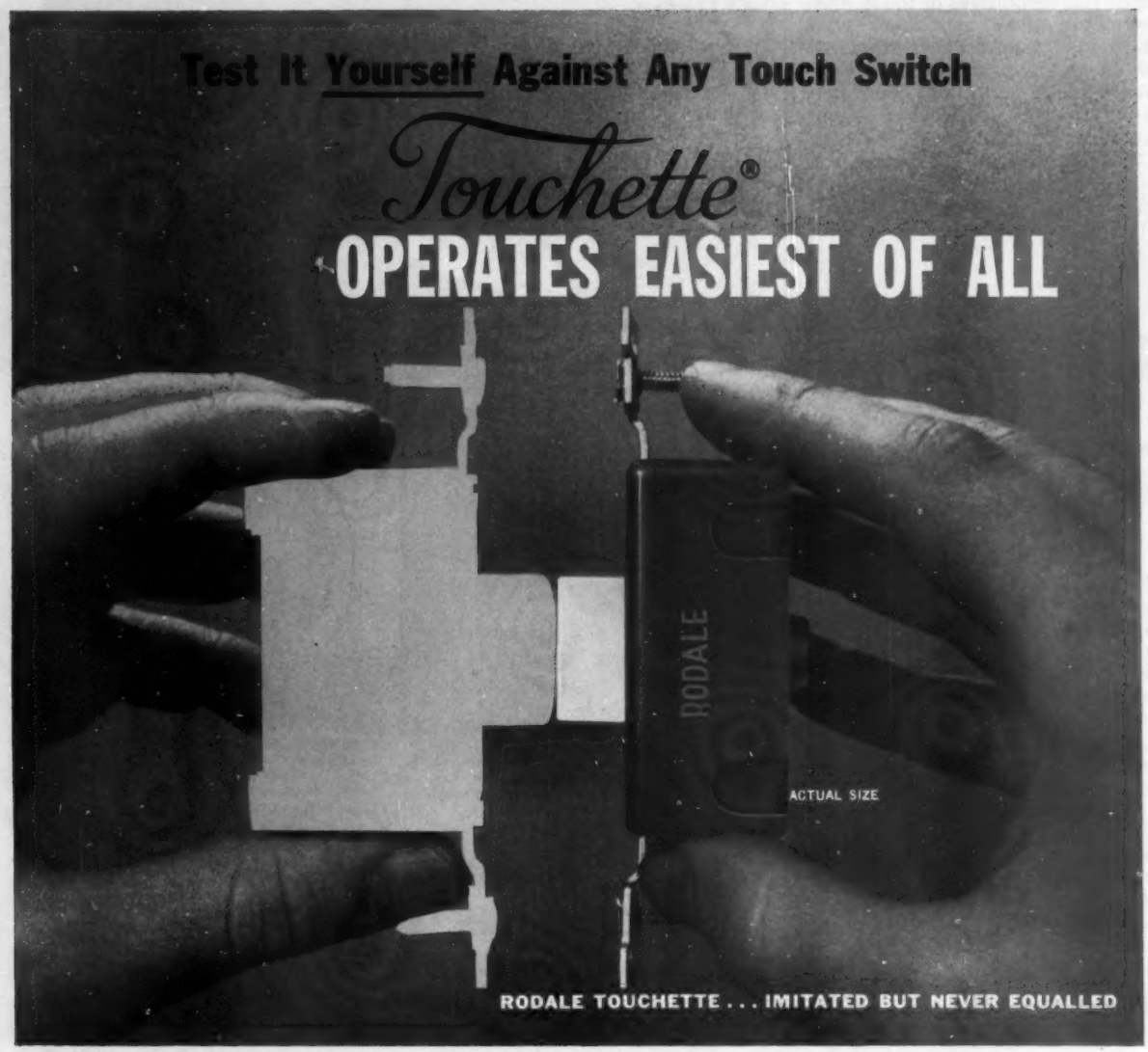

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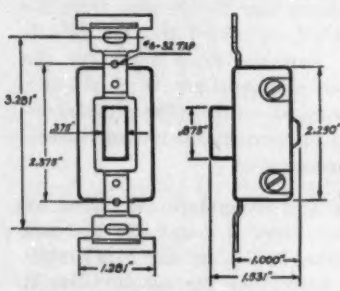

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Feature for feature, you'll find Touchette the ideal switch for new construction or remodeling jobs. Easy to handle, Touchette measures *just one inch in depth* . . . is quickly installed even in boxes where several wires already enter. Rated 15A-120-277V, Touchette operates on full line voltage . . . fits standard outlet boxes and toggle wall plates . . . needs no special wiring.

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L & P fluorescent and incandescent fixtures are distributed by wholesale dealers only. This is done not only in fairness to the dealers themselves, but to their customers as well. L & P distributors know that every L & P sale will be credited to one of their members. The ultimate L & P customer, in turn, knows that he can depend on a specific L & P distributor to make sure he gets the traditional L & P "service after the sale" in his area.

Distributors are regularly called upon by L & P agents. They look to these agents to keep them fully informed of the very latest developments in lighting fixtures, so that they, on their part, can advise their customers on the best possible fixtures to meet their own particular needs. This is personalized service—a product of L & P's manufacturer-agent-distributor-customer partnership.

LIGHT & POWER UTILITIES CORP. L&P

L & P LIGHTING

OLIVE BRANCH, MISS.

1035 FIRESTONE BLVD. • MEMPHIS, TENN.

Real Partners in Business

Among the smoothest-working teams serving L & P throughout the South is Associated Manufacturers Agents in New Orleans. Charlie Kleinschmidt and Harry T. Bailey, Jr. make "partnership in business" a real, living thing both for L & P and for their customers.

Charlie Kleinschmidt

Charlie is a native of New Orleans, attended both Loyola University there and the University of Minnesota, graduating with a BS in both business administration and engineering. He has been in the manufacturer's agency field since 1946, and formed Associated Manufacturers Agents with Harry Bailey in 1953.

Harry T. Bailey, Jr.

Born in Scottsboro, Ala., Harry attended Auburn University, and graduated with a BS in both electrical engineering and mechanical engineering. Before joining with Charlie in AMA, he was associated with Louisiana Power & Light Co. in New Orleans, as industrial sales engineer.

In addition to Harry and Charlie, the AMA agency is made up of B. I. Murphy, who operates their Baton Rouge office; David L. Lanham, who will open their Jackson, Miss. office in the near future; and R. G. Titherington and Warren E. Wood, who operate out of the main office in New Orleans.

According to Harry Bailey, all the folks at Associated Manufacturers Agents are thoroughly sold on L & P lighting fixtures. Their outstanding sales record would indicate that *their* customers are equally sold on L & P. Solidly experienced in their business, dedicated to complete customer service both before and after the sale, the AMA staff represents a striking example of how well the "partners in business" idea works for all concerned.

LIGHT & POWER UTILITIES CORP. L&P

L & P LIGHTING

Olive Branch, Miss.

1035 Firestone Blvd. Memphis, Tenn.

Distributed by Wholesale Dealers Only

There's an

L&P

Representative Near YOU!

For further information and prices on L & P fluorescent fixtures—standard or "custom-made"—check the following list, and phone or write the L & P representative nearest you:

(F—Fluorescent)
(I—Incandescent)

Associated Manufacturers Agents (F)
900 Carondelet St.
New Orleans, Louisiana

W. K. Carney Co.
P. O. Box 3145
Bellaire, Texas

James E. Clary (F-I)
62 Flicker
Memphis, Tennessee

Craig-Owen (F-I)
306 E. 11th St.
Chattanooga, Tennessee

C. V. Hammon (F-I)
845 S. W. 52nd St.
Oklahoma City, Oklahoma

J. F. Hisserich (F-I)
2001 Big Bend Ave.
St. Louis, Missouri

Howard E. Johnson (F-I)
2976 Randy Lane
Dallas, Texas

Allan M. Kahoe (I)
8849 25th St.
Metairie, Louisiana

Richard B. Murdoch (F-I)
7300 Bailor Ave.
College Park, Maryland

William B. Murray (F-I)
531 Western Ave., N.W.
Atlanta 14, Georgia

N. B. Nichols (F-I)
2509 Bishop
Little Rock, Arkansas

Joe E. Pearce & Associates (F-I)
50 N. Kenmore
Indianapolis, Indiana

Gerald Preacher (F-I)
116 N. Church St.
Lexington, South Carolina

Arthur H. Swartz (F-I)
2120 Polk Ave.
Houston, Texas

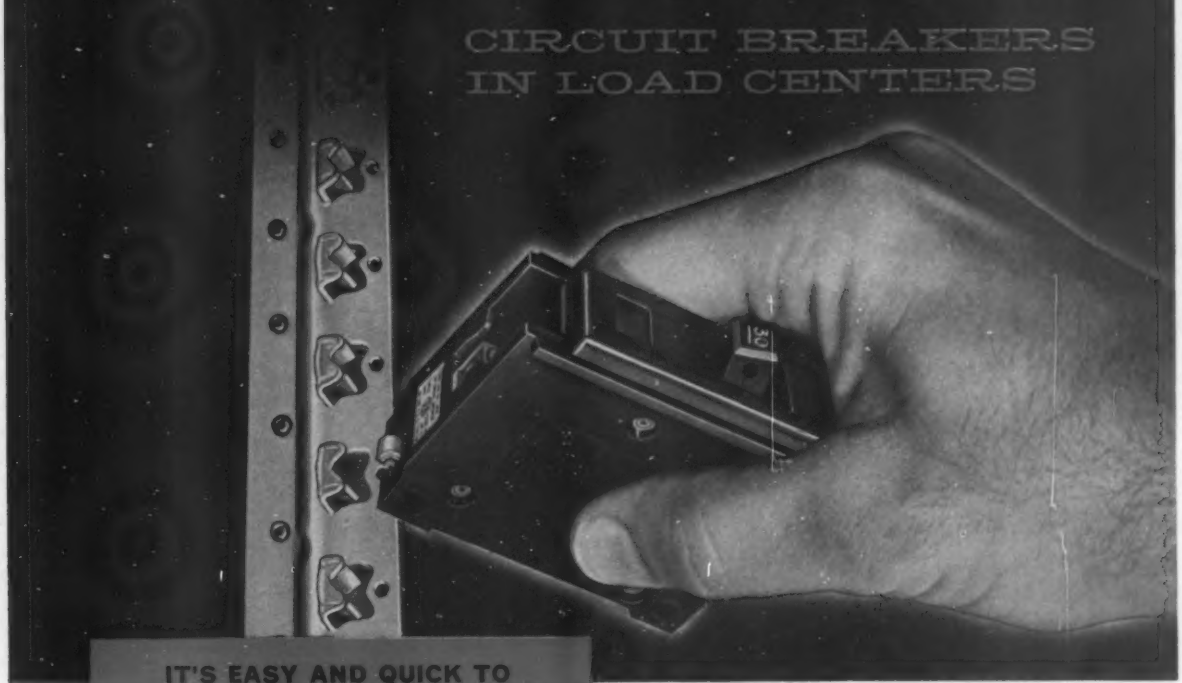
Light & Power Utilities Corp. (F-I)
P. O. Box 157
Olive Branch, Mississippi

For more details on above items, use reply card on page 27

NON-INTERCHANGEABILITY...
a big word for EXTRA SAFETY

FRANK ADAM

CIRCUIT BREAKERS IN LOAD CENTERS



IT'S EASY AND QUICK TO PREPARE (FA) LOAD CENTERS FOR NON-INTERCHANGEABILITY

Removal of interference tabs in mounting back takes but a moment with simple tool furnished by (FA) Distributor.

FRANK ADAM NEW LOAD CENTERS have sequenco bussing to permit any combination of 2-pole circuits—have dual-rated lugs for copper or aluminum wire (in 100-amp. centers and higher—plus many more features that make them a "best Buy."

FRANK ADAM Quicklag CIRCUIT BREAKERS are furnished in 1, 2 and 3-pole in 2 types:

QP—Plug-In QS—Bolt-On

Ratings: 15, 20, 30, 40, 50 and 70 amps.

KEEP PACE WITH ELECTRICITY
See our catalog in SWEET'S

To prevent installation of higher-rated circuit breakers into branches with lower capacities—this is the purpose of Paragraph 240-25G on non-interchangeability in the 1959 National Electric Code. Frank Adam QP breakers comply with these NEC requirements.

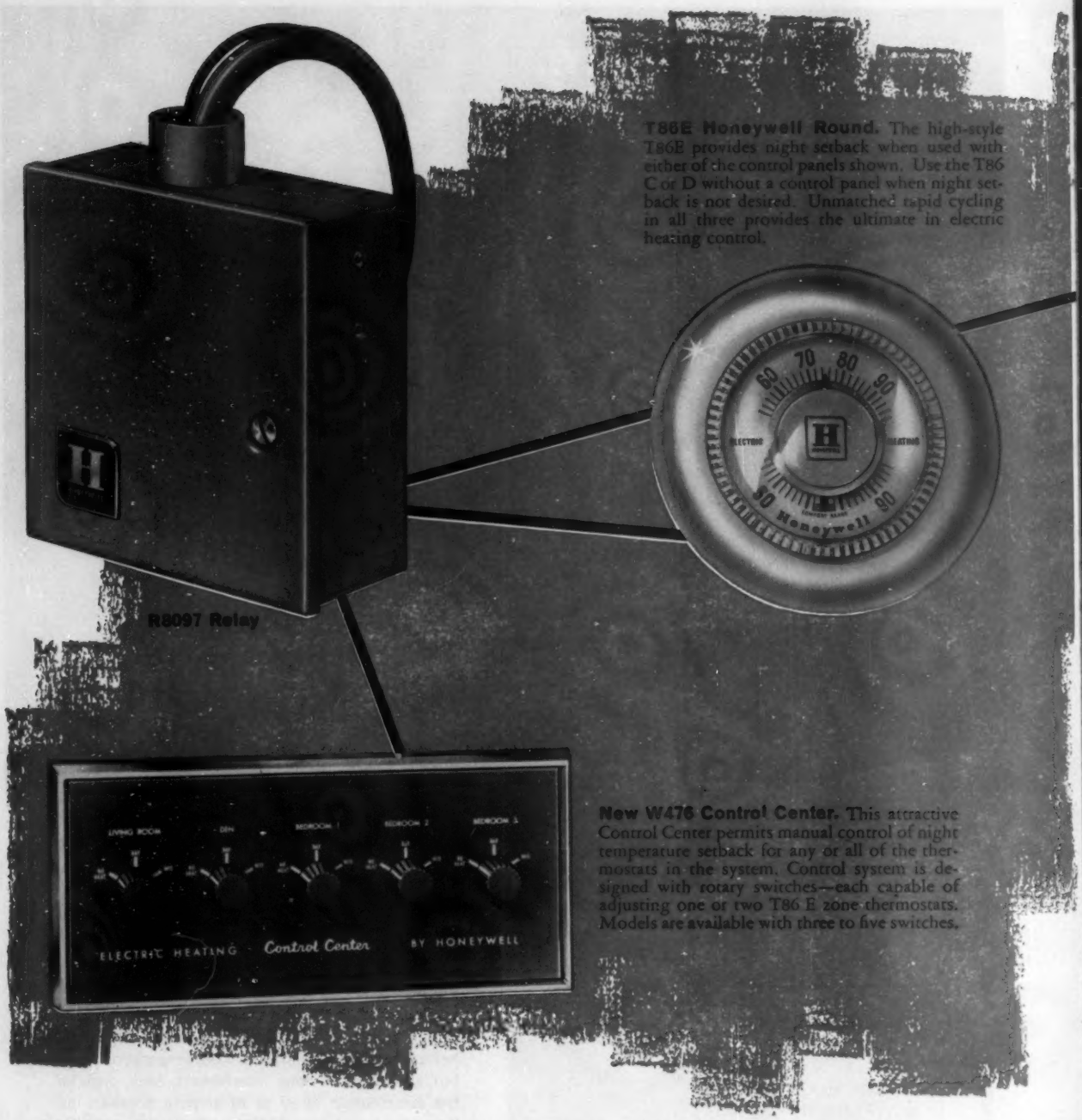
1, 2 and 3-pole breakers rated above 20-amps. are equipped with rejection slugs that require removal of interference tabs in load center mounting backs before they can be installed. This preparation takes but a moment. These interference tabs prohibit the substitution of 30 to 70 ampere breakers on the mounting back in place of smaller capacity breakers. Proper programing instructions are furnished to the installing contractor.

This *extra safety* feature is only one of the many reasons for the superiority of Frank Adam Quicklag Circuit Breakers. Get the complete story—*write for bulletin.*

FRANK ADAM ELECTRIC COMPANY
SINCE 1891
P. O. BOX 357, MAIN P. O. • ST. LOUIS 66, MO.

busduct • panelboards • switchboards • service equipment
safety switches • load centers • Quikheter

For more details on above items, use reply card on page 27

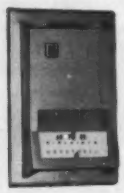


T86E Honeywell Round. The high-style T86E provides night setback when used with either of the control panels shown. Use the T86 C or D without a control panel when night setback is not desired. Unmatched rapid cycling in all three provides the ultimate in electric heating control.

New W476 Control Center. This attractive Control Center permits manual control of night temperature setback for any or all of the thermostats in the system. Control system is designed with rotary switches—each capable of adjusting one or two T86 E zone thermostats. Models are available with three to five switches.

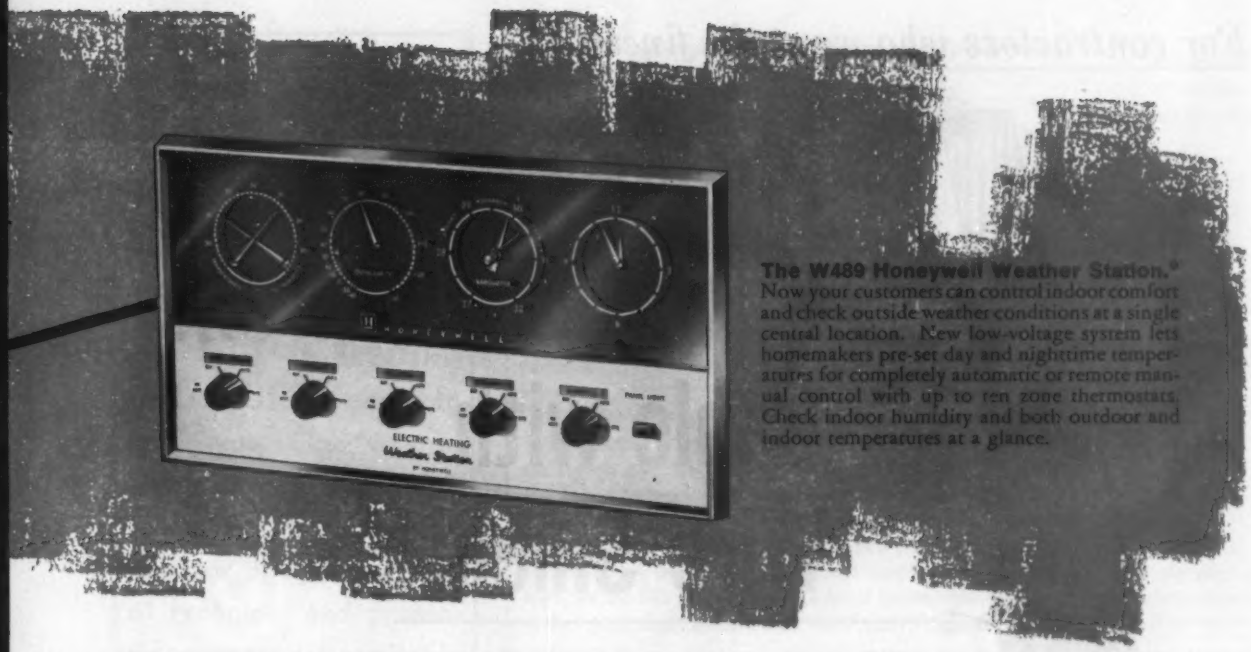
T832 *Day-Nite Round.* Unique thermostat features handy manual setback, automatic heat pick-up—day and night.

T87 *Heating-Cooling Thermostat.* With new finish, larger numerals. Same streamlined styling as the T86 Round.



T88B *Thermostat.* High-style economy thermostat with selectable heat anticipation and mercury switch operation.

T83A *Thermostat.* For budget-minded customers, a two-wire, low-voltage thermostat, with snap acting contacts.



The W489 Honeywell Weather Station.* Now your customers can control indoor comfort and check outside weather conditions at a single central location. New low-voltage system lets homemakers pre-set day and nighttime temperatures for completely automatic or remote manual control with up to ten zone thermostats. Check indoor humidity and both outdoor and indoor temperatures at a glance.

Bring out the best in Electric Heating with

HONEYWELL LOW VOLT CONTROLS!

Versatile R8097 Relay makes possible the widest range of control combinations ever offered the electric heating industry.

This completely flexible relay works perfectly with Honeywell low voltage thermostats or central control panels, giving your customers a choice of the ultimate in electric heating controls. These deluxe controls are engineered and designed especially for electric heating and they give you every assurance of top performance, top profits. What's more, you get immediate customer acceptance because of Honeywell's long established reputation for quality.

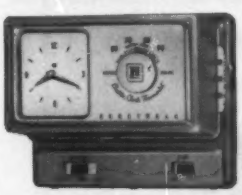
Total flexibility is yours when you feature the Honeywell line! In addition to the relay coupling with the top of the line, the R8097 is also adaptable to each of the wide selection of standard thermostats shown below. For further information on these—or on the finest in line voltage thermostats for electric heating—call your nearest Honeywell office. Or, write Honeywell, Dept. ES-4-81, Minneapolis 8, Minn. *Sales and service offices in all principal cities of the world.*

**Trademark*

Honeywell

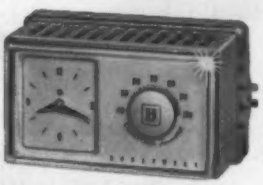
First in Control

SINCE 1885



T861 *Heating-Cooling Electric Clock Thermostat.* A deluxe control for year-round automatic day-night comfort.

Indoor-Outdoor *System.* T846A outdoors senses temperatures; T855A indoors compensates for changes.



T852 *Electric Clock Thermostat.* A deluxe thermostat providing completely automatic day and night heating comfort.

T870 *Heating-Cooling Thermostat.* A deluxe family that satisfies the complete range of heating-cooling needs.

For more details on above items, use reply card on page 27

For contractors who want the finest . . .

Phelps Dodge Habirite-Habirprene Cable with Wire Shield!

Phelps Dodge pioneered the use of a wire shield as a standard item in power cable construction. From this background and experience, Phelps Dodge developed its outstanding Habirite-Habirprene high voltage cable with a wire shield. This cable offers a number of advantages over ordinary "RR" cable with tape shield including:

1. Greater flexibility; minimum bending radius in most cases is less than half the bending radius of tape-shielded cable, making installation easier in confined areas.
2. Rugged wire shield can be braided or bunched for use as a ground lead at splices and terminations. Intermediate steps in making ground connections are eliminated, saving time and effort.
3. Dependable wire shield continuity provides protection against hidden shield rupture which can occur during installation or in service.
4. Overall wire shield resistance is constant without the variations found in tape-shielded cable.

Habirite-Habirprene cable with a wire shield assures you the utmost in safety, durability and handling ease.

See your Phelps Dodge Distributor!

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 PARK AVENUE, NEW YORK 22, N. Y.

PD

SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Fort Wayne, Greensboro, N. C., Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.

For more details on above items, use reply card on page 27

Are You Making Use of Our Reader Service?

The editorial and business staff of ELECTRICAL SOUTH is eager to serve you. One way in which we can help you is to make it easy for you to draw upon the wealth of technical and promotional material available from manufacturers.

In the accompanying pages are the descriptions of scores of useful catalogs, application information booklets, and technical publications. These are available without charge.

Check over the list of publications available, indicate the numbers of the ones you want on the postage - paid card to be found on page 27, and mail it to us with your name, title, company and address plainly written. We will tell each manufacturer to send directly to you the information you want.

ATTENTION: Architects, Electrical Engineers, Contractors and Design Consultants

NOW READY FOR YOU ...WRA... LATEST DESIGN BY STA-BRITE!

The newest of our ever-growing collection of contemporary designs—WRA—an unusually attractive wrap-around fixture, showing little metal, and completely adaptable to any situation . . . adding to any decor. A top value, producing desired foot candles, WRA has many facets to interest you—it's quickly installed, easy to maintain; it goes together without fastenings...the socket bar and channel cover lock in as a unit; it's plastic-hinged from either side and swings down easily for relamping, saving time and reducing breakage; the plastic prismatic lens assures low brightness; and it's available in two- or four-light sizes! To save you money, time, and trouble—this is the one aim of the design department of Sta-Brite... and if the new WRA just happens to be one of the best-looking fixtures on the market, that's because of our "light" touch! CALL ON US SOON.

DESIGNERS ENGINEERS MANUFACTURERS

THE ULTIMATE IN LIGHTING FIXTURES

Whatever your requirements in lighting homes, offices and factories—depend on STA-BRITE'S quality fixtures and experienced engineering staff.

Write on your company letterhead for Sta-Brite's 1961 Price List.

STA-BRITE FLUORESCENT MANUFACTURING COMPANY

TERRITORIES AVAILABLE

3550 N.W. 49th STREET • MIAMI 42, FLORIDA

SHERMAN TERMINAL LUGS AND CRIMPING TOOLS

SPEED INSTALLATION – REDUCE COSTS!

INDENTED CRIMP FOR GREATER RESISTANCE TO PULL-OUT

VOID FREE CONNECTION

MONEY SAVER

SAVE UP TO 15% WITH SHERMAN

Write for FREE Sample

SHERMAN UNI-CRIMP LUG

SHERMAN "ST" LUG

SHERMAN HAND CRIMPING TOOLS

Portable or bench mounted for fast, easy installation of money-saving Sherman terminal lugs.

H. B. SHERMAN MANUFACTURING CO., BATTLE CREEK, MICHIGAN

HANDIER THAN AN EXTRA HAND — that's Slipknot's exclusive, permanent plastic cutter-and-case — yours at no extra cost! This new tool saves time, tape and temper — and keeps your favorite tape clean and ready, whatever the job!

NOW... No. 7 SLIPKNOT
PLASTIC ELECTRICAL TAPE ...

ALWAYS CLEAN

in the NEW **FLIP-n-CUT** pat. pending
INSTANT TAPE DISPENSER
FREE... WITH EACH 66' ROLL

PLYMOUTH RUBBER COMPANY, INC.
QUALITY SINCE 1896 CANTON, MASSACHUSETTS

TAPES BY
SOLD ONLY THRU RECOGNIZED DISTRIBUTORS
PLYMOUTH RUBBER COMPANY, INC.

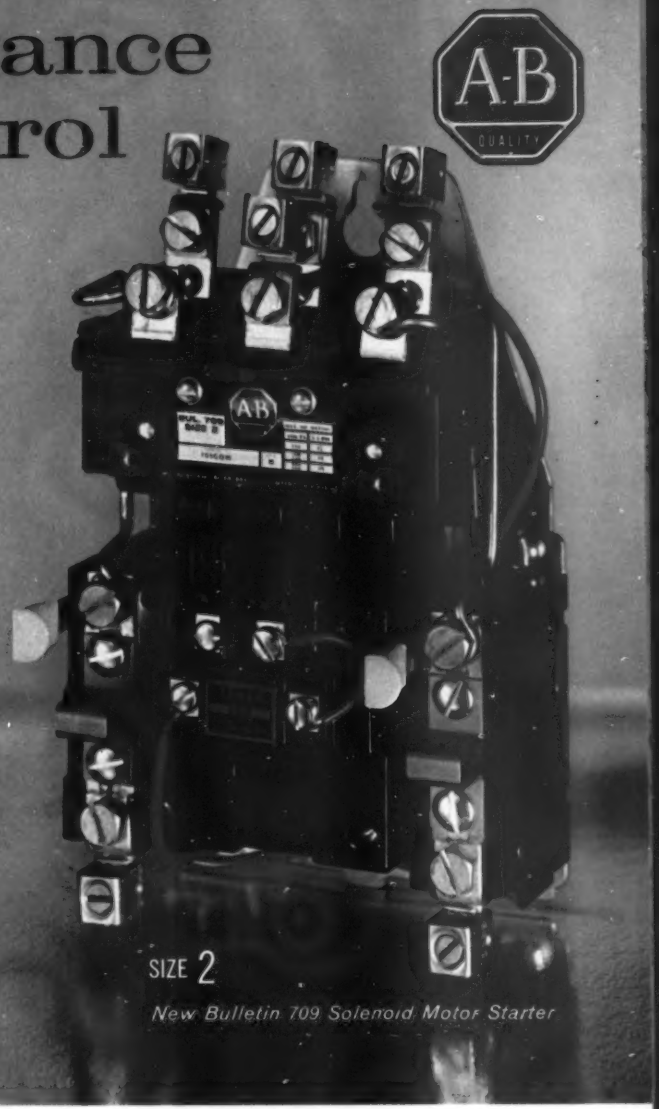
FL-3

a new line of Bulletin 709 motor starters by ALLEN-BRADLEY

- smaller size
- greater interrupting capacity
- even more millions of trouble free operations
- more wiring room
- elegant styling
- A-B "quality" throughout

A "family" of 7 starter sizes . . . each one entirely new

greatest advance in motor control in 30 years



New Bulletin 709 Solenoid Motor Starter

In appearance . . . in performance . . . in physical size and weight . . . these Allen-Bradley Bulletin 709 solenoid starters are *completely new in every way!*

NEW COMPACTNESS. Size reductions are so drastic you'll hardly believe your eyes. The tables below will give you some idea of how the new line of Bulletin 709 starters compares with the old.

A TREMENDOUS INCREASE IN LIFE—both mechanical and electrical. All of these new starters are good for many more millions of trouble free operations.

NEW PATENTED MAGNET. For its weight and size, the most powerful magnet used on motor control. Its short, cushioned stroke assures long contact life. A new, permanent air gap prevents any possibility of magnetic sticking. "Snap action" guarantees positive contact opening and closing.

NEW MOLDED COIL. Impervious to atmospheres that could cause trouble, and also protected against mechanical damage. All coils are easily removed—from the front of the starter.

NEW CONTACTS. New double break contacts of cadmium oxide silver resist welding . . . close and seat firmly without sliding or wear-causing motion.

NEW OVERLOAD RELAYS. Not only "trip-free" but also "tamperproof," to reliably protect motor and machines. Of course the new relays were designed to use the old Bulletin 709 heating elements which you have in stock.

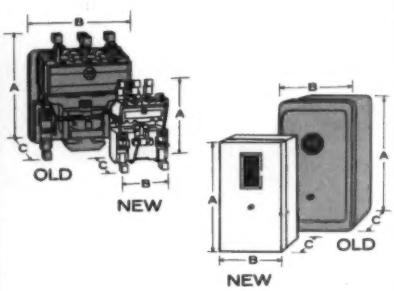
NEW ENCLOSURES. Completely restyled by Brooks Stevens—and so modern. They are a sales asset on any type of modern machine or industrial installation.

BETTER WRITE FOR MORE INFORMATION ON THIS REVOLUTIONARY NEW BULLETIN 709 STARTER!

CHECK THE "NEW" WITH THE "OLD" BULLETIN 709 DIMENSIONS

The wiring room in the new enclosures will delight the electrician.

Starter Size	OPEN TYPE STARTERS					
	NEW			OLD		
	Height A	Width B	Depth C	Height A	Width B	Depth C
00	3⅝	3⅜	3⅛	—	—	—
0	5⅞	4⅛	3 11/16	5⅝	4¾	3¼
1	6⅝	4½	3 11/16	5⅞	5	3¼
2	7¾	4⅝	3 11/16	10 1/16	5¾	4⅞
3	10¼	6¼	5⅞	12⅝	7¼	5⅞
4	11⅞	7⅜	6¼	16¼	12¾	6 11/16
5	14 13/16	9	6½	20	16⅛	8¼



Starter Size	NEMA 1 ENCLOSURES					
	NEW			OLD		
	Height A	Width B	Depth C	Height A	Width B	Depth C
00	7⅝	4⅞	4¼	—	—	—
0	9⅛	6 1/16	4⅜	7⅞	5⅝	4¼
1	10	6 13/16	4⅜	8 13/16	6⅜	4¼
2	12	7⅝	4⅜	14½	9	5⅞
3	16⅝	10⅜	7	19½	11⅜	6 11/16
4	22	11⅝	8	26 1/16	14 3/16	7 11/16
5	32 3/16	17 3/16	9⅞	41½	19 1/16	13 3/16

B-61-RM

ALLEN-BRADLEY

Member of NEMA

Quality Motor Control

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wisconsin

The exciting trend is to ELECTRIC HEATING—and the HOT LINE is AMERICAN-STANDARD "ELECTRI-WARM"!

"Electri-Warm"—the complete line of quality heating equipment that's priced to compete . . . American-Standard—the name you don't have to sell, you capitalize on . . . put these names together and you have American-Standard "Electri-Warm," the prestige entry in the fast-growing field of electric heating. There are "Electri-Warm" units for ceiling, wall, baseboard, floor—any place and every place you might be called on to install an electric heating unit. And the call for quick, clean, silent, maintenance-free electric heating is growing stronger and stronger all the time. The switch is on! The exciting trend is to electric heating—and the hot line is American-Standard "Electri-Warm"!

RADIANT WALL HEATERS
1 Ribbon Type—120-240 Volt—three sizes
2. Vycor Type—120-240 Volt—four sizes

FAN FORCED WALL HEATERS
3. Standard Type—120-240 Volt—two sizes
4. High Capacity—120-240 Volt—five sizes

CONTROLS
5. Five Thermostats (low and line voltage)

PORTABLES (Fan Forced)
6. 240 Volt—Dual Range—Integral Thermostat—three sizes

CABLE (Ceiling and Floor)
7. 240 Volt—Standard Reel Sizes

CEILING PANEL
8. Printed Circuitry—120 or 240 Volt—500 Watts

CEILING HEATER-LIGHT-EXHAUST-CIRCULATOR
9. Combination Unit—120 Volt—1450 Watts (Heating)

BASEBOARD
10. Economy—240 Volt—Low Density—four sizes
11. Standard—240 Volt—Low Density—four sizes
12. Deluxe—240 Volt—Hi-Density—four sizes

American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation

AMERICAN-Standard
AIR CONDITIONING DIVISION
ELECTRIC HEATING DEPARTMENT

AMERICAN-STANDARD ELECTRIC HEATING DEPT., 40 W. 40th ST., N. Y. C.
Send me details on selling the "Electri-Warm" electric heating line.
Name.....Position.....
Company.....
(Distributor? Contractor? Other?).....
Address.....
City.....Zone....State.....

For more details on above items, use reply card on page 27

EXPERIENCE ENGINEERED

COLOR-KEYED CONNECTORS

Sixty-five years' experience lies behind the COLOR-KEYED connector line from Noland, made by The Thomas & Betts Company. T&B Color-Keyed Connectors are designed for Code Copper Conductors and comprise the only complete line that covers the entire range from #8AWG to 1,000 MCM. There's a complete line for All-Aluminum, too! When you choose T&B, you choose the lowest installed cost. It's the only connector system with a full range of Tooling from pocket size to 40 Ton Hydraulic heads.

The new TBM8 Hand Tool puts a tool chest in your pocket! The only hand tool that installs connectors from #8AWG to 500 MCM, the TBM8 is the most efficient you'll find. T&B's 65 years' experience has proven that the correct tooling is as important as the correct connector.

The entire T&B line is available from your Noland man, the man who offers immediate delivery from one of the largest electrical supply stock in the South.

T&B ENGINEERED **THE THOMAS & BETTS CO., INC.**

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

37 BRANCHES SERVING THE SOUTH

NOLAND

NOLAND COMPANY INC WHOLESALE DISTRIBUTORS: PLUMBING HEATING
INDUSTRIAL ELECTRICAL REFRIGERATION AIR CONDITIONING MACHINE TOOLS

For more details on above items, use reply card on page 27

3 reasons why General Electric Slimline is America's most popular 8-foot fluorescent

Any time you see a long, unbroken line of fluorescent light, chances are good it's a General Electric Slimline lamp. Over the years, the G-E Slimline has proved . . .

1. *Your customers can cut parts maintenance almost in half.* A G-E Slimline system has about half as many parts as a standard 40-watt system, yet it produces the same amount of light.

2. *Your customers get 5% higher efficiency* from General Electric Slimline lamps than from standard 40-watt fluorescents. They get more light for every dollar of electricity.

3. *Your customers can make their places look better.* Slimlines start instantly, with no blinking. They have an excellent record of uniformity and long life because of General Electric's outstanding quality controls and manufacturing experience. Available in all popular colors.

There are 14 combinations of tube length and diameter to fit anyone's space requirements. Recommend General Electric Slimline lamps on your next job. General Electric Co., Large Lamp Dept. C-13, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

The nearsighted MISTER MAGOO says . . . "1945? Who could forget that year? Eagle-eye Magoo was mustered out of the Aircraft-Spotting Command, and General Electric invented the slimline lamp. Happy birthday, Slimline! Zounds —they don't make these telescopes like they used to!"

For more details on above items, use reply card on page 27

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

HYDRAULIC EQUIPMENT—Truck Equipment Co., 3963 Walnut St., Denver 5, Colo., has made available a catalog containing information on their lines of hydraulic derricks, cable reel carriers, and diggers. It is illustrated and contains data on design features, specifications, and application.

Write in No. A134 on card, pg. 27

CONDUIT AND DUCTS—Orangeburg Mfg. Co., Inc., 375 Park Ave., New York 22, N. Y. has made available informative literature. Catalog No. 52 includes complete details concerning advantages, installation, and properties of Orangeburg fibre conduit, standard conduit—type I, and Nocrete conduit—type II. Catalog 202 offers specifications, installation data, and diagram of the complete Orangeburg Underfloor duct system. Descriptions and catalog numbers of components are also given.

Write in No. A135 on card, pg. 27

ELECTRIC HEATING—A 34-page descriptive packet containing color illustrations and complete specifications of eight major types of electric heating units and controls is now available from Arvin Industries, Inc., Electric Heat Div., 13th and Big Four Road, Columbus, Ind. Both radiant and fan-forced heaters are included, in wall, baseboard, and ceiling models.

Write in No. A136 on card, pg. 27

WIRING DEVICES — Catalog No. 56, and New Products Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc., Brooklyn 22, N. Y. Over 100-pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable line, Lev-O-Lock line, and many, many others; devices for every possible use in Industrial, Commercial and Residential applications.

Write in No. A137 on card, pg. 27

CARBON PRODUCTS—A 28-page catalog on Motor and Generator Brushes and carbon products telling how to order brushes, grade recommendations, characteristics, and description of brush grades, is available from the Helwig Co., 2536 North 30th St., Milwaukee, Wis.

Write in No. A138 on card, pg. 27

LIGHTING FIXTURES—Progress Manufacturing Co., Castor Avenue and Tulip Street, Philadelphia 34, Pa., announces the publication of two new lighting catalogs. "Lighting by Progress," a 52-page booklet, describes their line of residential fixtures. "Home Lighting by Minute Mount" is a 12-page bulletin illustrating new ideas in budget lighting.

Write in No. A139 on card, pg. 27

CABLE, WIRE, AND CORD—Catalog 71A, punched for filing in looseleaf binder, has been made available by Carol Cable Co., Division of the Crescent Co., Inc., Pawtucket, R. I. Contained in its 24 pages is a complete listing of most of the types of wire and cable offered by the firm.

Write in No. A140 on card, pg. 27

ELECTRICAL EQUIPMENT—The Wadsworth Electric Mfg. Co., Inc., Covington, Ky., has issued a new catalog 58' Guide, containing data on their line of Safety Switches, Service Equipment, Distribution Panels, "E-Z-RED" Circuit Breakers, interchangeable and non-interchangeable, also wiring troughs.

Write in No. A141 on card, pg. 27

POWER BENDER — The lightweight hydraulic power bender #884, manufactured by Greenlee Tool Co., of Rockford, Ill., is described in a new bulletin issued by the company.

Write in No. A142 on card, pg. 27

ELECTRICAL FITTINGS—Concise 36-page catalog illustrates and describes a complete line of electrical fittings, cable racks and wiring specialties. The catalog contains many detail drawings, clear-cut photographic illustrations of mast fittings, cable connectors, traps, hangers and ground clamps in a wide variety of types and sizes. For your free copy, write The M. & W. Electric Mfg. Co., East Palestine, Ohio.

Write in No. A143 on card, pg. 27

WIRING DEVICES — A complete new illustrated catalog and price book is now available from E. M. Wiegmann and Co., Inc., Freeburg, Ill., covering their line of outlet and switch boxes, cut-out and pull boxes, wireholders and racks, and service entrance equipment.

Write in No. A144 on card, pg. 27

COMPRESSION CONNECTORS — New and fully illustrated Bulletin 13 offered by the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo., shows their complete line of Squeezon compression fittings. They make all overhead distribution connections from line wire to ground rod on aluminum, ACSR, copper, or combinations of them. Application and installation data are given for tap connectors of several types; service entrance, splicing, jumper and repair sleeves; terminals, stirrups and ground fittings. Mechanical and hydraulic installing tools for both dead and hot line work are listed.

Write in No. A145 on card, pg. 27

WATER HEATING BOILER — Precision Parts Corp., 400 N. First St., Nashville 7, Tenn., has available a bulletin containing catalog information on their electric hot water heating boiler, diagrams of the boiler, and data on the advantages of its use. The boiler comes complete with water circulator and safety valve on models A through K.

Write in No. A146 on card, pg. 27

ADEQUATE WIRING — "Bright Ideas for Ladies" is the title of a new booklet from American Metal Moulding Co., 146 Coit St., Irvington 11, N. J. The booklet was prepared by the Armoured Cable Section of the National Electrical Manufacturers Association to acquaint homemakers with the electrical wiring their homes need for full electrical living now and in the future.

Write in No. A147 on card, pg. 27

ELECTRICAL CONDUITS — "National Electric Conduits" is the 20-page Catalog No. 603 which describes and illustrates the many types of electrical conduits manufactured by National Electric Div., H. K. Porter Co., Porter Bldg., Pittsburgh 22, Pa.

Write in No. A148 on card, pg. 27

TRANSFORMERS—R T & E Corp., 1900 E. North St., Waukesha, Wis., has available a bulletin describing Terra-Tran transformers for residential underground distribution. The 15-page booklet is illustrated and contains complete information on construction, application, and design features.

Write in No. A149 on card, pg. 27

THE MEN WHO REALLY KNOW...

KNOW

Efcor

MEET "RED" LAMBERT, Superintendent for Whitehead Electric Company, Atlanta, Ga. During "Red's" 15 years in the electrical construction industry, he has used a great many EFCOR fittings and boxes like the one he is holding. In the 1375 Peachtree Building, The Whitehead Electric Company and professionals like "Red" and his men rely on top quality products like those manufactured by EFCOR, to match the integrity of their own work. The men who really know . . . know EFCOR.

1375 PEACHTREE BUILDING

ELECTRICAL FITTINGS CORPORATION • WOODSIDE 77, N. Y.

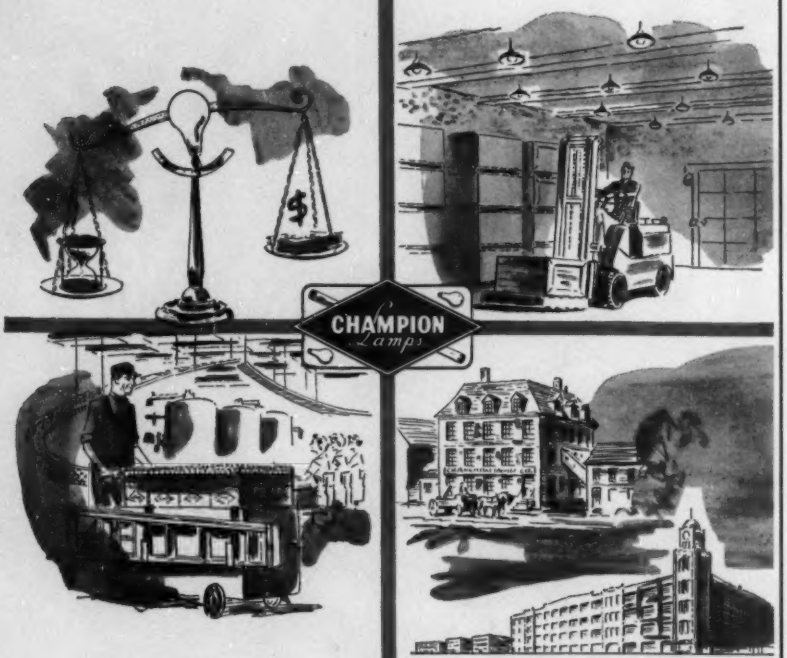
Facts of Light!

YOU CAN'T GET BOTH HIGH EFFICIENCY AND LONG LIFE IN INCANDESCENT LAMPS

General service incandescent lamps are designed so that the ratio between life and efficiency (light output) results in lowest overall lighting cost for the average installation. When efficiency is increased, lamp life is shortened. When lamp life is extended, efficiency goes down

SOME PLANT AREAS "STEAL" LIGHT

Poor reflective surfaces drastically reduce the useful light you get from a lighting system. For instance, brick walls reflect only about 13% light. Smooth walls painted white, on the other hand, reflect 80-85% light.



GROUP RELAMPING SAVES 17 MINUTES PER LAMP IN MAINTENANCE TIME

Maintenance studies show that it takes an average of 20 minutes to replace a single burned out lamp as against 3 minutes when lamps are group replaced.

SIXTY YEARS' EXPERIENCE GOES INTO CHAMPION LAMPS

Champion has been manufacturing incandescent lamps since 1900 and fluorescent lamps since their advent in 1938. Over 3,000 types and sizes are available.

Your Best Buy in Lamps

CHAMPION LAMP WORKS, Lynn, Massachusetts

CHAMPION INCANDESCENT-FLUORESCENT

CATALOGS and BULLETINS

ANCHORING DEVICES—An illustrated 32-page catalog, No. 70, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.
Write in No. A150 on card, pg. 27

CONNECTORS — Comprehensive, up-to-date information on electrical connections for overhead lines in transmission and distribution is now available in one convenient publication, a 10-page manual issued by Burndy Corp., Norwalk, Conn., on connection techniques, connectors, and installation tooling.
Write in No. A151 on card, pg. 27

ELECTRIC HEATING — Electromode Division of Commercial Controls Corp., 570 Culver Rd., Rochester 3, N. Y., is now offering their complete line of electric heaters and heating systems for the home. Descriptions, specifications and illustrations are included for wall and portable heaters for large and small rooms, radiant panel heaters, baseboard heaters and radiant cable heat.
Write in No. A152 on card, pg. 27

ELECTRICAL EQUIPMENT — A new 12-page pictorial bulletin briefly describes manufacturing facilities and electrical products of Crouse-Hinds Co., Syracuse 1, N. Y. Emphasis is on the variety of equipment available in the four product lines; Condulet electrical equipment, floodlights, aviation lighting equipment, and traffic control.
Write in No. A153 on card, pg. 27

CONNECTOR BULLETINS — Six new bulletins have been released by Ilsco Corp., 4730 Madison Rd., Cincinnati, Ohio. They cover the Ilsco line of solderless connectors, special connectors, lugs, neutral bars, crimp lugs, and the Ilsco Lok-A-Blok. The bulletins include descriptive material, dimensions, and packaging data.
Write in No. A154 on card, pg. 27

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St., Cleveland 11, Ohio.
Write in No. A155 on card, pg. 27

CATALOGS and BULLETINS

FLUORESCENT FIXTURES—The new Miller Sabre fluorescent fixture is illustrated in the Sabre catalog, page 13, published by The Miller Company, Meriden, Conn. This page points out application, construction details, and dimensional, illumination, and installation data.
Write in No. A156 on card, pg. 27

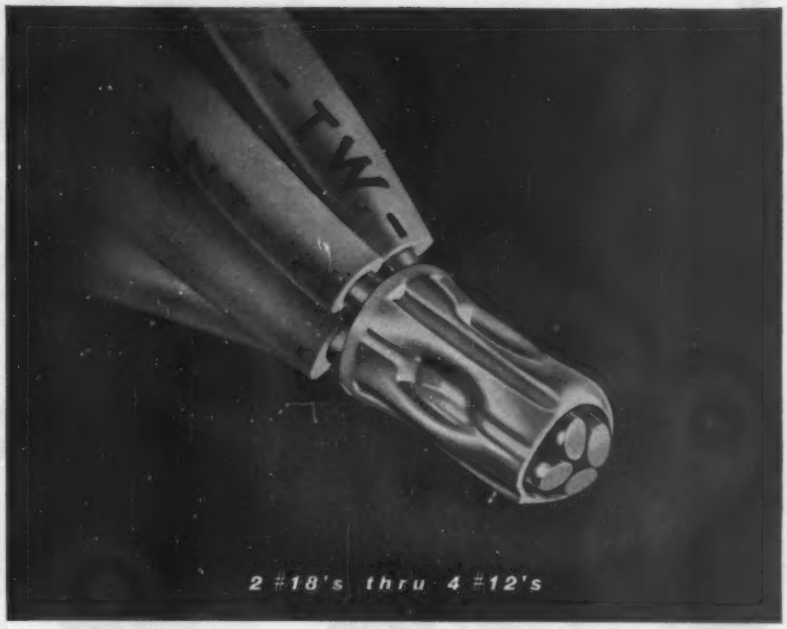
TROFFER CATALOG—A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.
Write in No. A157 on card, pg. 27

CONSTRUCTION ANCHORS — "Anchoring for Power and Communication Lines," a completely illustrated manual on improving line construction with better anchoring, has been published by the Advertising Dept., the A. B. Chance Co., Centralia, Mo. The 25-page booklet shows how to install the right anchor at the right place in the right way.
Write in No. A158 on card, pg. 27

SMALL WIRE STRAPS—Added to the one-hole Viking strap line are three new Midget straps for small wires. The #616 for fastening RX and UF 2/14, 2/12, and BX 2/14; the #416 for wires to 1/4" OD; and #316 for wires of 3/16" and 1/4". These galvanized straps, designed to take several sizes of wires; are featured in literature released by W. W. Cross & Co., Viking Cable and Fastening Devices, Greenville, R. I.
Write in No. A159 on card, pg. 27

RESIDENTIAL LIGHTING — A new catalog featuring their line of residential lighting fixtures has recently been issued by John C. Virden Co., 6103 Longfellow Ave., Cleveland 3, Ohio. The 48-page booklet is illustrated and in color. It pictures and describes incandescent and fluorescent fixtures for every room in the house and every design motif.
Write in No. A160 on card, pg. 27

SPLICE



Without WIRE TWISTING

EXPECT THE BEST FROM BUCHANAN. For instance, Buchanan's new 2008S Steel Splice Caps make better wire splicing faster than ever. They won't pull off, twist off or shake off of even untwisted wires. Crimp with Buchanan's reliable C24 pres-SURE-tool.

The 2008S clamps conductors in a vise-like crimp. Its exclusive fluted design strengthens the cap, helping to position the 2008S in the tool, and serving as a starting point for the tool's indenters. When the 2008S Splice Cap is crimped, the flutes confine the conductors in a tight area. Wires are flattened and deformed lengthwise for wire-to-wire contact. There are no voids between conductors, thereby eliminating looseness.

You insulate completed 2008S splices with Buchanan's 2007 Snap-On Nylon Insulators. They go on with a snap; provide quickest insulation in shortest time—even on fine wires and in coldest weather.

Get complete details about the new 2008S Splice Cap now. Call your nearest Buchanan representative or write for Bulletin S-4.

Actual Size

Splice caps listed as "pressure-type wire connectors" and "fixture-type splicing connectors" for 2 #18 thru 4 #12's. Insulators UL and CSA listed for 600 v. on building wire and 1000 v. in fixtures, in applications up to 105°C. (221°F.)

BUCHANAN ESNA

BUCHANAN ELECTRICAL PRODUCTS CORPORATION
HILLSIDE, NEW JERSEY
In Canada: ESNA CANADA LIMITED, Toronto 16

For more details on above items, use reply card on page 27

QUIET

ACTUAL SIZE

new

NO-KLIK Junior™

Circle F — with precise engineering design — and without mercury or other fluids — offers the No-Klik Junior, a rugged dependable and Q-U-I-E-T wall switch.

CHECK THESE FEATURES
Raised Cover Frame Fits Snugly Into Plate for dust free operation • Large Silver Alloy Contacts for dependable duty • Fully Enclosed in Bakelite for safe, lasting performance • New Low Price for added profits

Another fine product of Circle F know-how

GUARANTEED WIRING DEVICES

CIRCLE F MFG. CO.
TRENTON 4, NEW JERSEY

CATALOGS and BULLETINS

MODULAR LIGHTING—A twelve-page folder describing and illustrating their line of surfaced and recessed fluorescent modular fixtures is announced by Moe Light of Thomas Industries, Inc., Lighting Division, Brook & Broadway, Louisville, Ky. Complete coefficient of utilization and candlepower distribution tables are included for each set of fixtures.
Write in No. A161 on card, pg. 27

BUILT-IN HEATERS—Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Calif., has announced the availability of three new catalog sheets on their line of built-in electric heaters. The heaters described are their portable radiant-fan heater, electric ceiling heater, and baseboard electric heater.
Write in No. A162 on card, pg. 27

CABLE SUPPORTING TRAYS — The Globe Co., 4000 South Princeton Ave., Chicago 9, Ill., has made available a new catalog on their line of cable supporting tray systems and accessories. The catalog contains information on design features, specifications, and installation.
Write in No. A163 on card, pg. 27

CONDUIT — With Rigid Polyvinyl Chloride Electrical Conduit gaining increasing popularity in the electrical field, Kraloy Plastic Pipe Co., Inc. offers a new, complete 20-page catalog. Included are comprehensive test results, specifications information, installation instruction, corrosion resistant charts, and other valuable data. Write Kraloy Plastic Pipe Co., Inc., Electrical Conduit Division, 402 West Central Avenue, Santa Ana, California.
Write in No. A164 on card, pg. 27

SWITCH & OUTLET BOXES AND ELECTRICAL FITTINGS — Catalogs B-960 and F-960 respectively feature the latest in switch and outlet boxes and electrical fittings. Completely illustrated, they contain over 100 pages of technical and informational data. A unique set of indexes in the fittings catalog make it the easiest reference catalog in its field. Available from the Electrical Fittings Corp., 37-50 57th St., Woodside 77, New York.
Write in No. A165 on card, pg. 27

INFORMATION CENTER

Help yourself to free literature and more details on any products mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, equipment, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins
New Utility Equipment
New Electrical Products
Advertisements

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

APRIL, 1961

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

_____ _____ _____ _____ _____ _____
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_____ _____ _____ _____ _____ _____

Send this FREE LITERATURE (fill in key numbers):

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_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send free information on these ADVERTISEMENTS:

Company _____ Page _____ Company _____ Page _____
Company _____ Page _____ Company _____ Page _____

My Name _____ Position _____
My Company's Name _____
Address (number and street) _____
City _____ Zone _____ State _____

APRIL, 1961

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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Send this FREE LITERATURE (fill in key numbers):

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Send free information on these ADVERTISEMENTS:

Company _____ Page _____ Company _____ Page _____
Company _____ Page _____ Company _____ Page _____

My Name _____ Position _____
My Company's Name _____
Address (number and street) _____
City _____ Zone _____ State _____

These cards can help you get valuable information

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South
1760 PEACHTREE ROAD, N. W.
ATLANTA 9, GEORGIA

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South
1760 PEACHTREE ROAD, N. W.
ATLANTA 9, GEORGIA

H-560 Series . . . Thrift Trim Baseboard Heetaires . . . Automatic or Manual . . . totally enclosed finned sheathed elements.

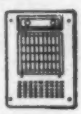
370 Series . . . Heavy Duty Automatic Recessed and Surface-Mount Fan-Forced Heetaires . . . totally enclosed stainless steel finned sheathed elements . . . 2000 - 4000 Watts, 240 v. AC.

260 Series . . . Automatic Recessed and Surface-Mount Fan-Forced Heetaires . . . 2000 - 4800 Watts, 240 v. and 208 v.

240 Series . . . Wall Radiant Heetaires . . . 1000 - 1500 Watts, 120 v. or 240 v., automatic or manual.

530 Series . . . Space Saver Radiant Heetaires . . . 50% smaller wall space . . . 660 Watts, 120 v. DC or AC.

500 Series . . . Fan-Forced Radiant Heetaires . . . 1250 - 2000 Watts, 120 v. or 240 v. AC . . . patented neo-glo heating elements.



520 Series . . . Fan-Forced Bathroom Heetaires . . . 1250-1500 Watts, 120 v. or 240 v. AC.

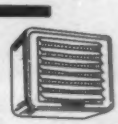
190 Series . . . Fan-Glo Heetaires . . . patented neo-glo heating elements GUARANTEED FOR LIFE . . . Also a complete line of 120 v. and 240 v. portables.

280 Series . . . Ceiling HEETAIRES . . . Heetaire-Lite-Exhaust, Heetaire-Lite, and Radiant Heetaires . . . 1000 - 1500 Watts, 120 v. and 240 v. AC.

290 Series . . . Surface Mounted Ceiling Radiant Heetaires . . . with and without circulating fans . . . 660-1250 Watts, 120 v. AC.

170 Series . . . Heavy Duty Automatic Fan-Forced Portable Heetaires . . . 2000-4800 Watts, 240 v. AC.

600 Series . . . Heavy Duty Unit Heaters . . . Stainless steel finned sheathed elements . . . 2000-10,000 Watts; 208, 240 and 480 volts, single or three phase.



HOW BIG, HOW SMALL, HOW TOUGH is your HEATING PROBLEM?

Residential? Commercial? Institutional? Farms? Industrial? Any Other?

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MARKEL ELECTRIC HEAT

Quality Equipment and Engineering Know-How

SOLVE IT!

Get the Facts FREE!

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145 SENECA ST., Dept. ES, BUFFALO 3, N. Y.

☐ Please send me a FREE copy of your 20-Page CONTRACTOR'S SPECIFICATIONS BINDER.

NAME .....

FIRM .....

ADDRESS .....

CITY .....

For more details on above items, use reply card on page 27

Wiring profit workshop unveiled

Complete with visual aids, it will show electrical contractors

This article should be especially helpful to the following readers:

- **Electrical Contractors** ✓
- **Electrical Utilities** ✓
- **Electrical Wholesalers** ✓
- **Electrical Inspectors**
- **Industrial Engineers**
- **Consulting Engineers**

◆ A newly created Commercial Wiring Profit Workshop was unveiled by the National Wiring Bureau at the 17th annual National Wiring Sales Conference, recently held in Chicago.

Purpose of the well-planned workshop is to show electrical contractors how to promote and sell in the commercial market and make money doing it.

Nearly 200 conferees attended (despite the tie-up of major airlines throughout the country) the conference at the Sherman Hotel, February 23-24.

Delegates representing electrical contracting firms, power companies, electrical distributors, manufacturers, and electrical leagues and wiring bureaus participated in wiring promotion problems and their possible solutions.

Conference chairman was Herbert E. Cook, executive secretary of the Michigan Electrical Industry Association, Detroit, Mich., and chairman of the Plan Committee of the National Wiring Bureau, which sponsors the conference.

Coincidentally, two speakers, E. O. George, vice-president of Detroit Edison Co., and Martin Bartling, assistant to the president of United States Gypsum Co., called for urgent attention to the problem of better residential wiring systems.

In his keynote address, Mr. George said he was greatly disturbed because "we promote better wiring without making better wiring available to our builders, contractors, and customers." He underlined the need for "developing a complete wiring system to meet our loads of tomorrow."

"Industry," he said, "is spending millions of dollars to research improved generation [and] . . . better and lower cost transmission and distribution systems. But," he asked, "is money or time being devoted for an industry coordinated research on improved wiring systems?

"Systems that will make it possible for customers to obtain all the energy they want, where they want it, when they want it, and at a cost in keeping with the value of the service?"

He concluded his remarks with the expressed hope that a research foundation be established toward this end.

Later in the day, Mr. Bartling also dealt with this subject, calling attention to the fact that great industrial corporations are developing new construction methods to reduce time and cost of building homes.

"But somehow," he said, "the building industry and the electrical industry have not coordinated their efforts to find a rational solution" to the problem of wiring systems.

"I would urge this group to get into the business of research . . . meet with our research people and other people in the industry . . . I make a plea to you gentlemen that before another year is passed we have a task force working to solve these problems."

Programs unveiled

The major national promotion programs, in the fields of both residential and commercial wiring, were unveiled by representatives of the National Wiring Bureau and Edison Electric Institute, and several outstanding local promotion campaigns were reviewed.

In a dramatic presentation entitled, "Sing Out—Sell Up in 1961," John F. Roberts, assistant sales manager, Philadelphia Electric Co., and John C. Catherwood, coordinator of market development and training for the Long Island Lighting Co., Mineola, N. Y., described how Dorothy Collins, TV star, will help sell wiring and Full Housepower during the year.

Miss Collins' picture will appear on all National Wiring Bureau materials announcing "Dorothy Collins' Bright Idea! Full Housepower Makes a Happy Home."

In addition, EEI will run a double-page Housepower ad in *Life, Better Homes and Gardens,* and the *Saturday Evening Post.* The bureau will tie-in with the *Post* ad in the fall, with a contiguous half-page, black and white ad of its own.

This bureau ad will aid local promotion because (1) it will be oriented to the local electrical contractor and (2) it will, in some cases, be substituted with a local ad which will appear in those copies of the *Post* circulated in a particular state.

This arrangement, according to the speakers, under the *Post's* "Select-A-Market" plan, is expected to stimulate considerable interest among the country's promotion-minded utilities, leagues, and contractor groups.

Wiring profit workshop

Porter Henry, Jr., president of Porter Henry & Co., Inc., New York, described the forthcoming Commercial Wiring Profit Workshop. It will be a six-hour course divided into sessions for either one full day or two half days of intensive training for electrical contractors. The course is intended to create an interest among contractors to promote wiring modernization in the commercial market and teach them exactly how to go about it.

The workshop is sponsored by the bureau in cooperation with the National Electrical Contractors Association. It will be available for everybody, however, anywhere one is scheduled. It provides the means to launch one or a series of meetings to take advantage of growing contractor interest in

at annual wiring sales meeting

how to promote and sell successfully in th commercial market

making money out of non-bid jobs.

Specific subjects that will be covered include the importance of creative selling to net real profits, how to make a quick survey of local business potential, and selecting a target from the five main saleable services and the ten main saleable prospect categories.

In addition, it will deal with lead-getting devices and how to use them, selling the benefits of the proposed job to the prospect, and planning and executing successful sales calls.

The workshop will be implemented by slide films, sound motion pictures, buzz sessions, visual sales pieces, and permanent reference material.

The workshop should be ready by April 15. Each kit will include complete guidance data for conducting the sessions, along with a set of all requisite audio-visual materials, and 25 sets of the take-away pieces for the contractor participants. The estimated cost of the complete kit will be $250.

A detailed folder on this workshop can be obtained by sending the name, company affiliation, and mailing address of the recipient to Andrew Corman, Director, Commercial Wiring Promotion, National Wiring Bureau, 155 E. 44th St., New York 17, N. Y.

The bureau's advertising cam-

(Continued on page 131)

Exhibit and Medallion Home boost wiring in Memphis

◆ A promotion booth at a builders' exhibition and a Gold Medallion Home were used during the past year to promote wiring in Memphis, Tenn.

According to Fred M. Niell, of the Memphis Light, Gas, and Water Div., an all-electric heat promotion booth was shown at the Home Builders Show held last spring. Every piece of heating equipment in the booth could be operated for demonstration purposes.

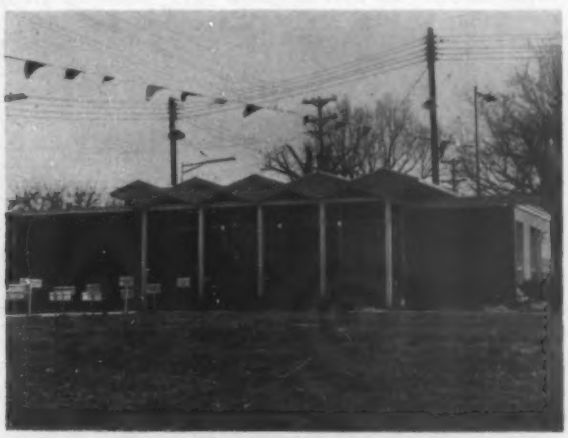
Many people saw electric baseboard, ceiling cable, infrared heaters, and wall heaters for the first time. Builders of homes and their prospective buyers were invited to discuss their problems with trained heating engineers who manned the booth at all times.

Memphis' first Gold Medallion Home was built in the fairgrounds just outside the building housing the Home Builders Show.

The home was complete in every respect and was heated and cooled by a heat pump attached to a perimeter distribution system using floor registers.

After it was exhibited, the Gold Medallion Home was moved intact a distance of six miles, set on a new lot, and was then immediately sold.

The exhibit at the Memphis Home Builders Show featured electric heating, and equipment could be operated.



Memphis' Gold Medallion Home was heated and cooled by a heat pump on a perimeter distribution system.

Successful Housepower promotion

An investment of $21,500 by an electrical league brought returns

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By William G. Hills, Managing Director, The Electric Institute of Washington, Washington, D. C.

◆ I want to describe a specific example of what can happen, and does happen, for the good of all when people in our industry work together toward a common goal.

The start of this goes back to December, 1959. In that month, the board of directors of the Electric Institute of Washington decided that we should conduct a year-long newspaper and radio advertising campaign to promote Full Housepower—adequate wiring for the home.

For the purpose they had in mind, the directors appropriated $21,500. At the time, that seemed to us like a lot of money.

But, when we came to make our plans, we were appalled at what a small amount we had to spend in proportion to what we were expected to do.

Do you have any idea of how much—or, rather, of how little—newspaper space and time on the air you can buy in Washington, D. C., for $21,500—for a year-long advertising and promotion campaign?

For example, you can buy less than one page of advertising a month in either of the leading metropolitan newspapers, exclusive of art work and production costs.

We had been given a job and money with which to do it. We had been given a free hand to build a greater demand for more Housepower in our trading area.

But, when we looked at the size of our appropriation—and looked at the size of our assignment—we soon realized that we were sadly lacking in financial power—to come anywhere near doing the job we were expected to do for Housepower. But we got busy and figured out the answer.

The idea with which we came up enabled us to spend our $21,500 judiciously—and to parlay our relatively small investment into a return of more than $900,000 in actual business for our contractor members, plus an undetermined amount of additional business for our distributor members and our equipment manufacturer members.

First we invited a representative of the National Wiring Bureau to attend a meeting of our Housepower Planning Committee, and to advise and counsel the members.

We were given a complete picture of the Edison Electric Institute's 1960 national advertising campaign on Housepower.

And we were given the full details of the National Wiring Bureau's merchandising program whereby groups like ours can tie in with national advertising, and take advantage of it.

We attached ourselves firmly to the Edison Electric Institute's national advertising campaign. Instead of paying out money for the preparation of our own ads, we made use of the national ads.

EEI ads used

We took the Edison Electric Institute's four-color Housepower ads precisely as they were, reproduced them in black and white—they came out perfectly—and ran them over our own signature in the five leading suburban newspapers in the Greater Metropolitan Washington area—out in the residential districts where home ownership is high.

All the ads which we ran were timed to coincide with the appearance of the national ads.

In addition to our ads in the suburban papers, the Potomac Electric Power Company placed 9,800 lines of straight Housepower copy in the metropolitan and county papers—and throughout the year, consistently mentioned Housepower in its appliance ads.

The only costs we had were the costs of the actual newspaper space for our own ads. The Edison Electric Institute provided us with glossy prints of its ads. The space rates in these suburban papers are low compared with the rates the city papers charge us—and so our money went a long way.

Newspaper advertising is but one of the tools we used. Here's how we merchandised Full Housepower to the consumer directly.

Housepower game

The Electric Institute of Washington, in cooperation with the Potomac Electric Power Company, devised a game which answers questions about Full Housepower for the home.

This game was played by people who attended the Montgomery County Fair, the Prince Georges County Fair, and the District of Columbia Home Show. Attendance at these three affairs totaled a quarter of a million Housepower prospects.

The game consisted of 12 playing boards. Each board was designed as the floor plan of a six-room house. A person stood before each board. A bingo-type drawing of numbers then selected a particular room at a certain board. The person having that room placed a plug into a receptacle in the right room.

At the same time, an attendant, using a public-address system, extolled the advantages of Full Housepower in that room of the house. For example, each circuit for kitchen appliances was explained, together with the benefits

This article has been adapted from comments made at the recent National Wiring Sales Conference in Chicago.

results from industry cooperation

totaling over $900,000 in actual business to contractor members

to be derived from the various appliances served.

Well—the first board, in each case, to plug in all six rooms won a Full Housepower prize, an electric alarm clock. Then, every player received a 150-watt light bulb as a reward for playing the game. Much emphasis was placed on the importance of 160- to 200-ampere entrance capacity.

Credit on wiring jobs

At the 1960 Home Builders Show in Washington—in cooperation with our contractor members—we offered 15 credit awards of $100 each toward a full Housepower wiring job. The awards were made at the Potomac Electric Power Company's exhibit booth. More than 5,000 people entered the drawings for these awards.

Attendance at this particular show totaled approximately 62,000. Each visitor to the Pepco exhibit was given a leaflet, containing a reproduction of our 900-line ad on Housepower, and telling the advantages of Full Housepower—and listing all of our contractor members.

A check of the contractors revealed that, in all but two cases, the award winners took advantage of the $100 credit on additional wiring in their home. One contractor reported to us that after talking with one of the winners he was able to upgrade the wiring job to nearly $600.

Two of the winners asked the contractor to apply the $100 credit to the purchase of a window air conditioner. The contractor did this—but in so doing, he ran a 20-amp special circuit to the unit—a necessary part of the job.

The entry cards in the contest were distributed equally to the participating contractors — for their use in following-up the prospects.

To stretch our advertising dollars even further—and to avoid having to pay the high national advertising rates which the Washington newspapers charge us as a trade association—we set up a 50-50 cooperative program with our contractor members—who pay local rates.

This plan was highly successful. Our contractor members ran more than 125,000 lines of cooperative newspaper advertising on Housepower over their individual signatures.

Here's how the plan worked. The Electric Institute of Washington agreed to pay 50 per cent of newspaper and radio advertising costs to contractors who promoted and advertised Full Housepower.

All advertising placed by the contractor had to be devoted to wiring and contractor services. No reimbursement was allowed for

(Continued on page 129)

Displays, forums, sales courses push Housepower acceptance in Baltimore

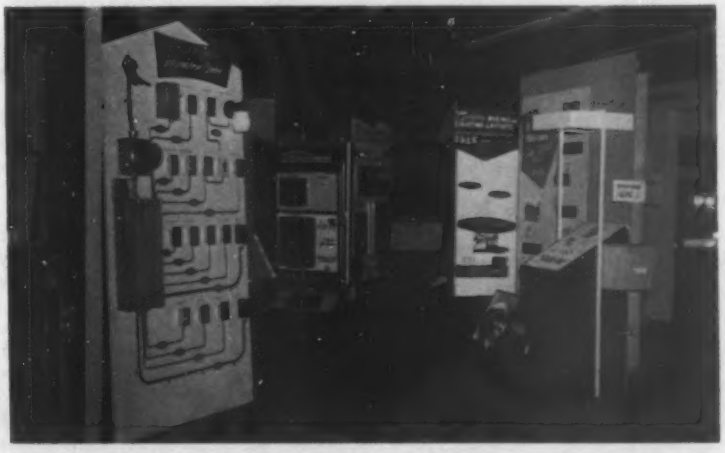
◆ Housepower received greater acceptance in Baltimore during 1960 than ever before, according to H. F. Carr, manager of residential sales promotion for Baltimore Gas and Electric Co.

Seventy-two per cent of all residential service changes were of 100-amp capacity, or larger, and even greater gains are expected. Electrical contractors, in contrast to past years, have shown a marked improvement in their sales presentations.

This improvement, according to Mr. Carr, can be attributed to the Housepower forums, profit clinics, and constant promotional activities conducted by the utility.

The utility-sponsored sales training courses, conducted at the University of Baltimore, were highly popular, and it is believed that ef-

(Continued on page 130)



The Housepower Information Center attracted many viewers at a fair.

Electrical contractor has become

And today the biggest problem which is facing the wiring industry

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By Harold A. Webster, President, NECA, Inc.; President, T. Frederick Jackson, Inc., Long Island City, N. Y.

◆ Every wiring installation in the United States today that is more than ten years old is completely out of date!

Now just stop and think that over for a moment. Need I say more? The modernization market alone is a market so vast that we must work as a team to sell it!

Let's examine the electrical contractor's responsibilities as a member of the industry team. We are the only members of the team who can furnish, install, and guarantee the entire electrical job! Also we are at the point of sale on the customer's premises more than any other member of the industry team, and thus we have the greatest sales opportunity.

We have heard about the excellent commercial and residential wiring programs that have been developed by the National Wiring Bureau, by the Edison Electric Institute, the Electrical Association of Philadelphia, the Electric Institute of Washington, and many others.

We of the National Electrical Contractors Association, as sponsors of the bureau, have been happy to assist in the development of some of these programs. We are particularly excited about the bureau's sales training workshop, because this is taking sales training directly to the grassroots level to stimulate the contractor to sell. Sell he must and sell he will!

For years we have heard our fellow team members cry that electrical contractors are not sales-minded, that they would rather bid a job than sell it, that they sell a job down rather than up.

Electrical contractors are doing a lot more selling than most of us realize. I believe every responsible electrical contractor is aware of the growing demands being made on our industry and in varying degrees is trying to sell installations geared to accept future growth.

Success at Con Ed

I don't know of a more successful adequate wiring program anywhere in this nation than the eight-year old activity started and still led by the Consolidated Edison Company in New York. This program covers private homes, apartment buildings, and non-residential structures, and last year alone it accounted for the rewiring of 2,510 apartment buildings containing 87,992 dwelling units.

The close cooperation between the utility company and contractors is borne out by the fact that 45 per cent of the 1960 apartment house wiring modernization was initiated by contractors, according to figures obtained from Consolidated Edison.

Let me cite a few figures and developments. The 1960 new apartment construction scheduled in New York City by private owners totaled 244 buildings containing 29,391 dwelling units. This was a typical year.

Ninety per cent of these dwelling units started life fully air-conditioned, that is, the wiring cooling equipment was in place. The other ten per cent had the requisite wiring and needed only the purchase of room coolers by owners or tenants.

Thirty-nine per cent of the kitchens have a dishwasher and ten per cent more have the wiring and plumbing to accommodate a future installation. Twelve per cent of bathrooms are electrically heated, 87 per cent have larger than ten cubic foot refrigerators or combination refrigerator-freezers.

And varying percentages of electric ranges, kitchen exhaust fans, auxiliary lighting, and other electrical uses were involved.

Ninety-nine per cent of these dwelling units had a three-wire supply to each—the average capacity being such as to allow each apartment to pull a demand of approximately ten kva.

A most significant fact is that such installations were virtually unknown ten years, even five years, ago.

The 10,403 one- and two-family houses rewired in my area last year now have an electrical capacity of about six times the inadequate system formerly existing. Consolidated Edison has stated that in 1952, only 30 per cent of the new private houses built in New York City that year had a three-wire service. Last year 100 per cent were three-wire.

There were 97 non-residential buildings electrically modernized in New York City in 1960. What happened was that 12,307,213 square feet of tenant space had 40,318 kva of additional riser capacity installed, an average of 3.25 kva per thousand square feet.

New office building wiring is providing 12 to 16 watts of capacity per square foot—and every such structure is completely air-conditioned, as has been the practice since World War II.

Contractors sell

Now where does the contractor fit into this burgeoning activity, other than sometimes to design the wiring system and always to install it and the utilization devices?

He has become an active salesman and promoter. Individually, and jointly with others through his trade associations, he is carrying on promotional and advertising

This article has been adapted from comments made at the recent National Wiring Sales Conference in Chicago.

active wiring seller and promoter

is how to make contractors have more interest in the selling angle

campaigns in the interest of adequate wiring, lighting, electric heating, air conditioning, kitchen modernization, industrial electric heating, commercial cooking and baking, automation—in short, the entire gamut of electrical energy uses.

We fully recognize our sales responsibilities and we take them seriously. We know that these are exceptions and we know that there are not enough contractor salesmen. So we have started to do something about it.

Some years ago we tried to analyze our economic ills in the electrical contracting industry and we found there were two simple solutions to the problem of making more money: the first was education and the second was selling.

We found that 80 per cent of our members were small businessmen who employed ten men or less and that they needed help to become better businessmen.

Ten years ago we set up a technical and training program, and at a cost of several million dollars we have trained more than 7,000 contractors and their employees how to run their businesses more efficiently and profitably.

Now we come to the sure way to make more money—selling. That means we need to hire and

(Continued on page 128)

New Orleans home show has Full Housepower exhibit

◆ A special Full Housepower exhibit at the annual home show—the International Home Festival—depicted the advantages of Full Housepower for residents of New Orleans during 1960.

According to J. R. Guidroz, sales promotion manager for New Orleans Public Service, Inc., it had side panels showing Full Housepower electrical equipment, and three center panels, which were full color drawings, rotated in unison and symbolized the Full Housepower story. Booklets were also distributed, and over 100,000 persons visited the show.

The exhibit, with modifications, was subsequently installed on the main office sales floor and later on a continuing basis at the New Orleans Housing Mart. It will be continued through 1961.

Residential representatives from the utility made 2,352 calls to discuss the benefits of Housepower. These contacts resulted from advertising or telephone calls requesting information. Dealer representatives contacted builders and electrical contractors to promote the inclusion of Full Housepower in new or remodeled construction.

(Continued on page 129)

The exhibit first appeared at New Orleans' International Home Festival.

This is shown on a continuing basis at the New Orleans Housing Mart.

Studio requires complex lighting

Commercial photographer noted for color work doubled size of facilities and wanted to increase electrical service for existing and future needs

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✓

By Bob King, Electrical South Southwestern Editor, Dallas, Texas.

◆ When a Dallas, Texas, commercial photographer called in the electrical contracting firm of Davis-MacPhail for a job in his studios, he explained his problem to them simply.

The studio had been doubled in size by taking over the building next door and taking down part of the wall in between, and he wanted to increase his service to take care of existing and future needs.

William Langley, nationally known for his work in color photography, pointed out that a great amount of illumination is required for proper reproduction of objects being photographed in the studio, particularly for color work.

"Scoop" and square reflectors, 1,500 watts each, and 24 500-watt overheads, with panel switches, light main studio.

Practically all of his work is in color.

Lighting for this type of studio ranges from 200- to 2,000-watt incandescent bulbs of all types in spot or floodlight fixtures, portable and stationary, plus other special equipment.

Presently, the studio could muster 600,000 watts of illumination if all the lighting equipment should be energized at one time. As the lighting is distributed throughout several areas in the two studios, this is not likely to happen, but heavy wiring is required for the numerous specialty lights.

Photographic bulbs in the studio have a 3,200 K (Kelvin) rating. Kelvin rating is the method used by color photographers to get the proper light values of objects being photographed.

This method was invented by an Englishman, Lord Kelvin, who determined by heating various objects that any object, no matter what its structural makeup, when reaching a certain temperature will emit the same quality of light.

Photographic flood lights contain gas to hold the temperature at 3,200 K so that the illumination is more even and the object to be photographed can be reproduced in its true color on the color film, which is also rated at 3,200 K.

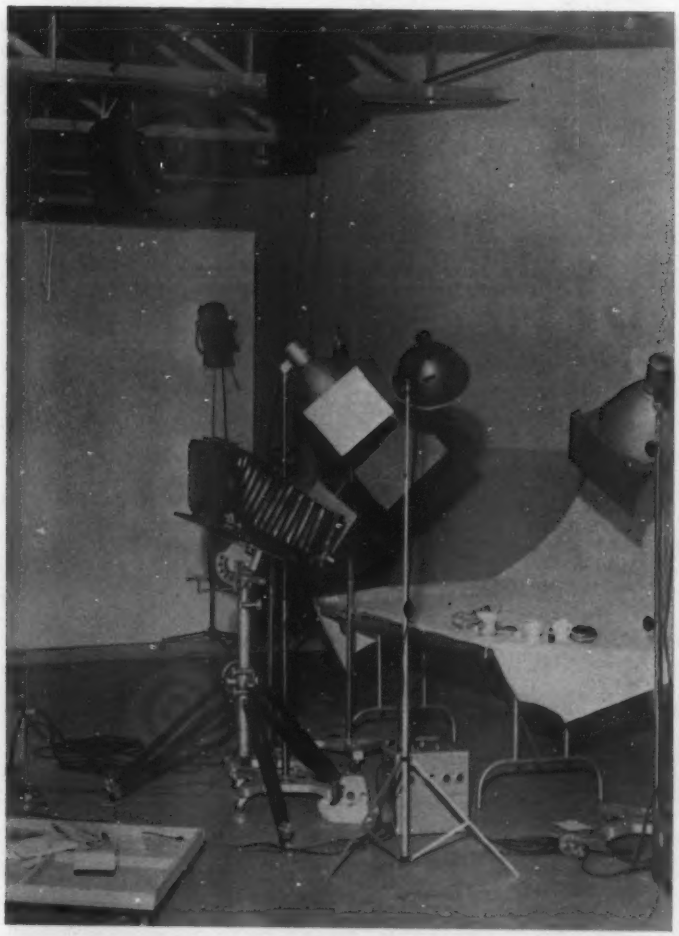
Ordinary light bulbs have a Kelvin rating of about 2,900, which gives a reddish tone, as does any rating lower than 3,200. A higher rating, for example 3,400 K, gives a bluish tone.

If the special gas filled photographic bulbs with 3,200 K rating are not used, a ColorTran voltage regulator controls the Kelvin rating of the bulbs. A control switch will boost or lower the voltage to give the proper 3,200 K, which can be checked on a built-in gauge on the unit showing the Kelvin rating. An amp gauge is also on the unit to keep check on amperage required.

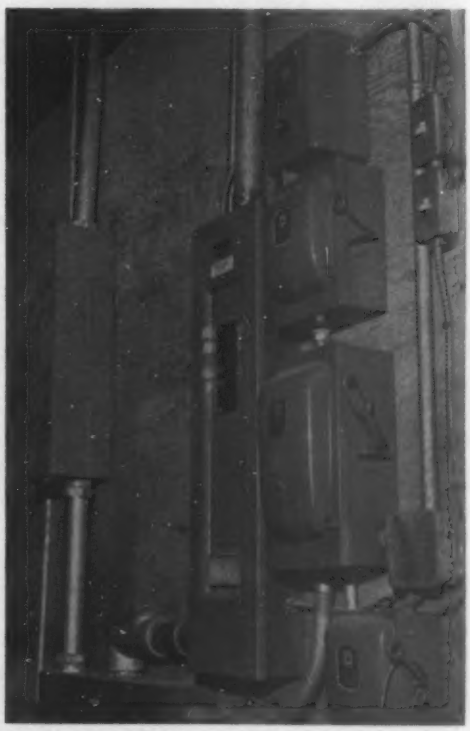
Davis-MacPhail, however, was concerned only with providing more service in the studio to take care of increased wiring needs for such special type equipment. Existing service in the main studio had a 200-amp capacity.

Overhead lights in the main studio are wired to a 24-circuit panel box with individual switches for each fixture to provide maximum lighting control. Each of the 24 overhead fixtures has a 500-watt floodlamp. A double pole, double throw safety switch is also tied in to this system to give full or half brilliancy for the overhead lights.

Three 100-amp circuit breakers were installed connecting to three outlet boxes near the floor. Port-



A concentration of light is needed for even small areas, such as this food picture. Ten 1,500-watt overhead flood reflectors are to be mounted here for pictures of autos and other large objects.



Existing service for main studio had 24-circuit panel with 20-amp breakers to control overhead and outlet boxes. This installation also provides for office lighting, and air conditioning controls. The junction box at the left receives the feedback line from the new distribution center.

Brilliantly lighted 'white room' gets special treatment

able outlet boxes plug into these either through flexible cable or No. 8 standard rubber insulated copper wire cable.

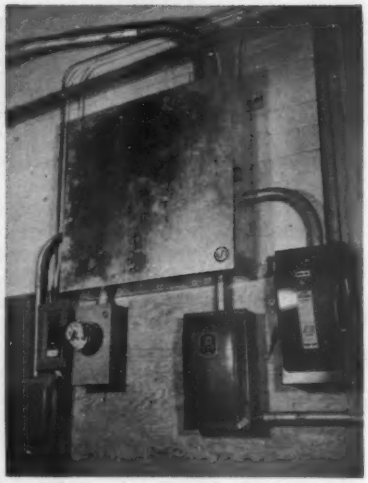
A 24-20 amp circuit box, part of the existing service, controls the office lighting and the air conditioning. From this existing service, with 200 amps capacity, Davis-MacPhail decided it would be necessary to triple the service, boosting it to 600 amps.

They mounted three 200-amp safety switches just beneath the CT transformer box which they also installed, and brought in the 600-amp feeder line through 3½-inch steel conduit.

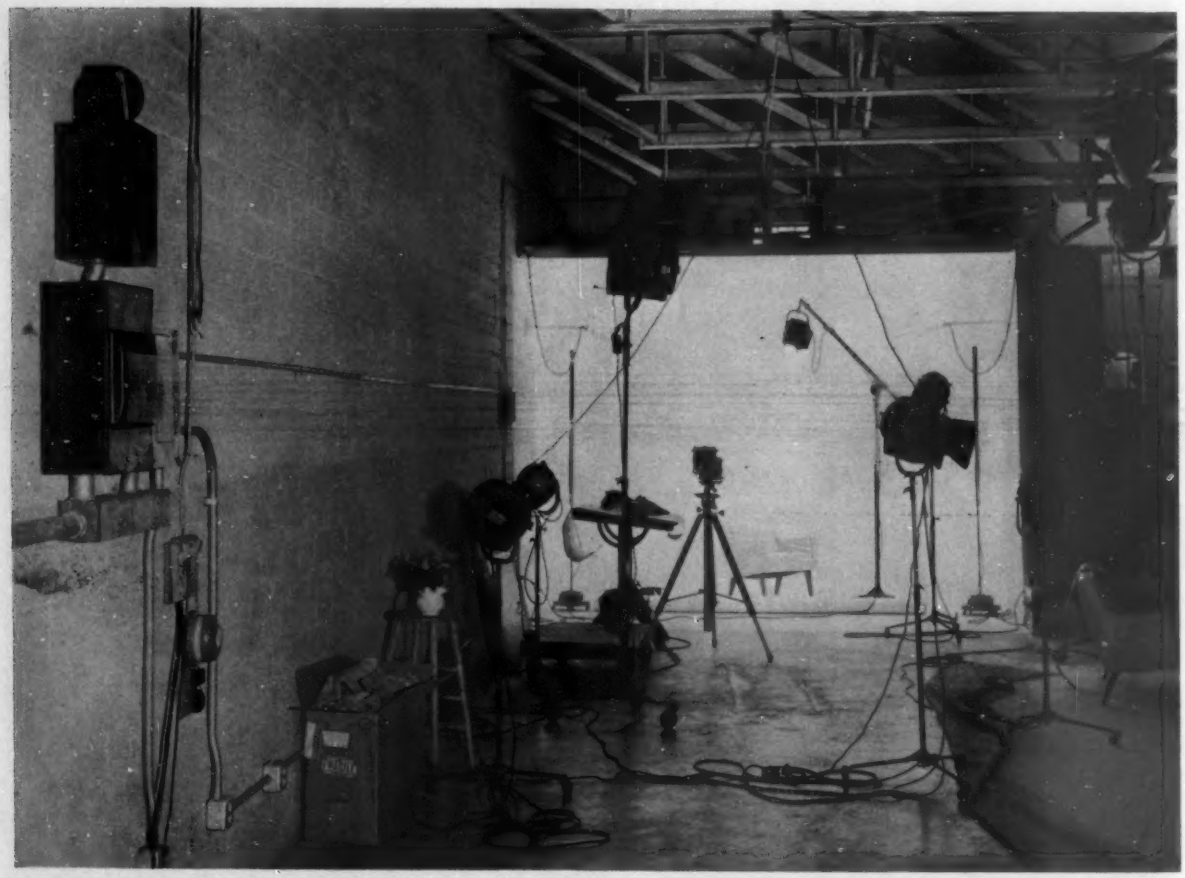
Two 750,000 MCM RHRW and one 300,000 MCM RHRW were added next. From this main distribution center, a three-phase, four-wire line feeds back to the main service through a two-inch conduit. Conduits were mounted on the walls a few feet up, or along the wall near the ceiling to cut down costs.

To control the specialty lighting in the new section of the studio, a 20,000-watt capacity auto-transformer with built-in cooling fan was mounted on the wall. The transformer has a double pole, double throw switch so that lights in this studio may also be controlled from full to half brilliancy.

(Continued on page 128)

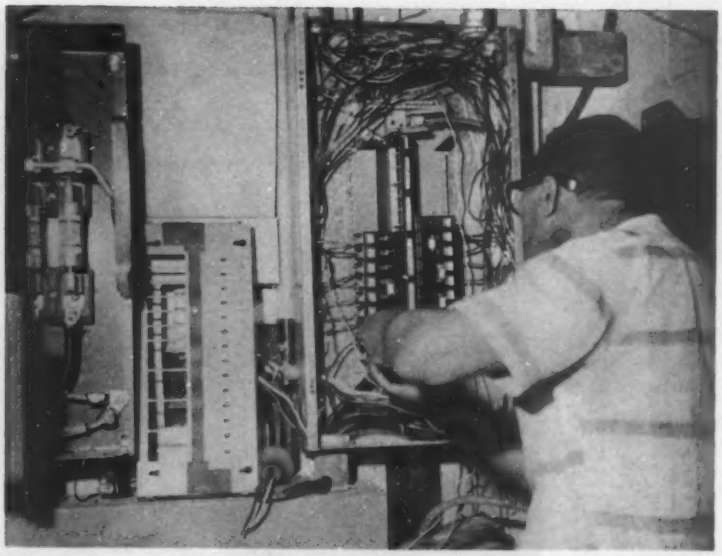


Three 200-amp safety switches were installed near CT transformer box at distribution center in new section. Two-inch conduit from switch box, right, is feedback to main studio.



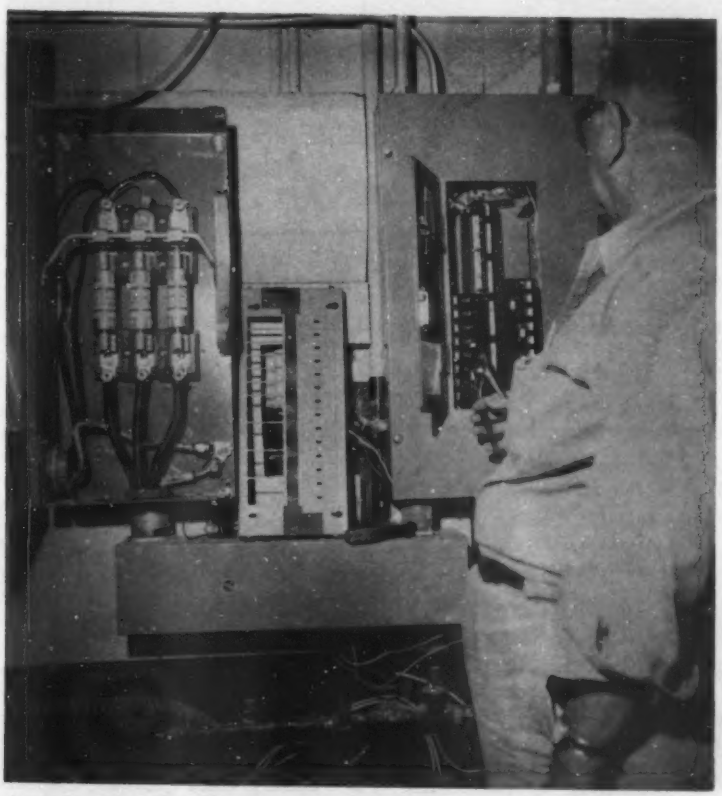
The 20,000-watt capacity auto-transformer, left, with a built-in cooling fan, takes care of the special lighting in the new studio. The 16-circuit panel box, just to the right of the transformer, connects to ten double base outlet boxes below, near the floor, and to a six-circuit panel through ¾-inch conduit, near the "white room" in the background. High brilliancy of light in this room is achieved by reflection from the walls and from 16 150-watt flood lamps. The portable spotlights seen in the studio range from 750 to 2,000 watts.

Education needed for heavy-ups



Circuit breakers are installed in the distribution panel. Education is needed to show people the value of heavy-up installations.

Frequently misinformed public must be taught the meaning of electric power service capacity



A mechanic tightens lugs on a disconnect switch at a disconnect panel. This installation will increase service from 60 amps to 200 amps.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers

By Walter M. Dawson, Dawson Electric Contracting Co., Washington, D. C.

◆ The constantly increasing volume in heavy-ups as people turn to electricity to reduce their workload, provide more comfortable working conditions, or expand their businesses for the accommodation of greater traffic and sales has kept Dawson Electric Contracting Company very busy in the past year.

We noted an 18 per cent gain in residential and commercial heavy-ups during the first half of 1960 as compared to the corresponding period of 1959. In the older sections of the city, where single phase 30-ampere service is most prevalent, we are now installing three-phase, 100-200-ampere service in accordance with our own recommendations for customer needs.

Education is the outstanding problem for the contractor recommending increasing the service capacity to homeowners, apart-

(Continued on page 126)

An eight-meter assembly makes an efficient and attractive prefabricated component for the park.

Assembling components in shop cuts labor 25 per cent

Prefabrication of meter boxes and their pipe supports as well as lighting standards speeds trailer park work

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✓

By Harry J. Miller, Electrical South Field Editor, Sarasota, Fla.

◆ Like other Florida areas, the city of Bradenton is permeated with trailer parks—new and old. As a consequence, a good bit of the electrical work done by James R. Ward of Ward Electric in Bradenton is derived from the installation of underground distribution facilities in the parks.

By and large, electrical service within trailer parks falls into two categories, one of which is the traditional aerial poleline service installed by the utility, with its complexity of poles and sprawling overhead feeder network.

With the present trend to luxury in the newly-built parks, however, there is a tendency to go to underground service, which gives a more aesthetic appearance,

(Continued on page 128)

The meter assembly is mounted and completely put together in the shop.

Prefabricated units are hauled to the site by truck. Heavier assemblies are put in place with a winch.

Ward Electric built this bench to test components. It has single and three-phase 115-230-volt current.

Prefabricating these lighting standards saves many hours of labor when wiring sprawling trailer parks.

Ward designed and built this structure to house switching equipment at one trailer park.

JOB-PROFIT TOOLING IDEAS

FROM GREENLEE

New lightweight Wire Puller for fast one-man operation

- **WEIGHS ONLY 29 LB**
- **TWO-SPEED WINCH . . . 3 TO 1 AND 9 TO 1 RATIOS . . .**
- **PATENTED RATCHET ACTION**

Easily carried and operated by one man, the new GREENLEE No. 766 Wire Puller requires only 30-lb handle pressure to pull 1500 lb. Wire can be pulled at any angle from large or small outlet boxes or from the end of exposed conduit. At all times the pull is in line with the conduit . . . no strain on the hanger or outlet box. No loose cable to contend with . . . reel holds 200 feet of aircraft steel cable. Patented winch ratchet action . . . open-side pulley support for easy access to any outlet box. Typical performance: Large Midwest contractor reports pulling four strands of 4/0 wire through 165 feet of 2½-inch conduit with two 90° bends. Time, *20 minutes.*

For large-size cable pulling use Greenlee No. 765 Cable Puller

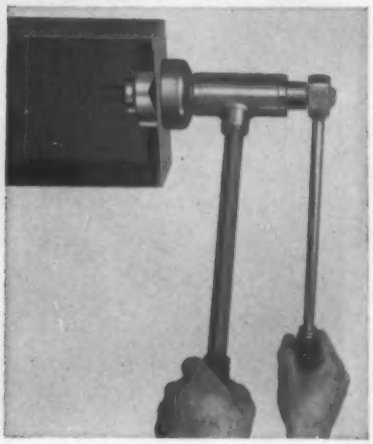
ONE-MAN OPERATION • 7500 LB PULL • TWO OPERATING SPEEDS

Portable . . . easy to set up and operate. Use it on exposed or concealed conduit. Pull is in line with the conduit with no strain on the hangers or outlet boxes. Can be equipped with flexible elbow attachment for pulling from concealed conduit . . . permits placing puller at any desired distance from end of conduit.

Hand and power drivers for knockout punches

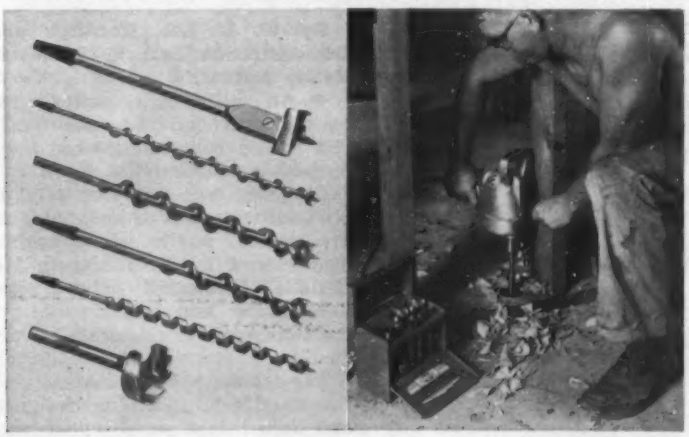
Greenlee No. 7646-A hydraulic knockout punch driver develops 11 tons' ram force to easily drive punches through 10-gauge metal . . . cuts ½" thru 5" conduit openings in seconds. Many times faster than wrench method . . . can be used in cramped quarters. Timesavings quickly pay for this efficient tool. Designed to drive all Greenlee knockout punches. It is available singly for punches already owned or is available in sets with 6 or 10 punches.

Greenlee one-shot knockout punch drivers are fast, lightweight, and powerful . . . easily operated by one man. Require no pre-drilling or step-up punching to make conduit openings . . . high-strength aluminum "C" frame. Punch cuts through 10-gauge steel with ease. Two sizes: No. 1731 to punch holes for ½", ¾", 1" conduit and No. 1732 to punch holes for ½" thru 4" conduit. Hand or power pump operated.



Greenlee ratchet knockout punch driver makes conduit openings 6 to 8 times faster than with wrench method. Easily operated in any position. Use with standard Greenlee knockout punches from ½" thru 3". Available singly or with set of punches for ½" thru 2" conduit.

Greenlee makes a complete range of knockout punches for 1/2" thru 5" conduit . . . fast, easy cutting through 10-gauge metal . . . clean, accurate holes.



Fast-boring Greenlee bits for electrical work

Jobs go smoother when you standardize on Greenlee precision-made boring tools. Power drill and hand brace types . . . various styles and lengths for all types of electrical work. Electricians' auger bits, bellhangers' drills, solid-center auger bits, expansive bits, ship augers, pipe bits, spade-type power bits. Highest quality for fast, accurate boring and long life under hard usage.

Hand ratchet benders

Fast, easy way to make bends up to 90° in ½" thru 1½" rigid conduit. Greenlee ratchet bender is self-contained and easily portable. Ratchet action for short, powerful strokes . . . easy-to-reach ratchet release . . . built-in 0° to 90° bending gauge . . . swing-away pipe clamp for easy removal of 90° bend . . . direct handle operation for quick bending of small pipe. No. 1800 for ½", ¾", 1" conduit. No. 1801 for 1¼" and 1½" sizes.

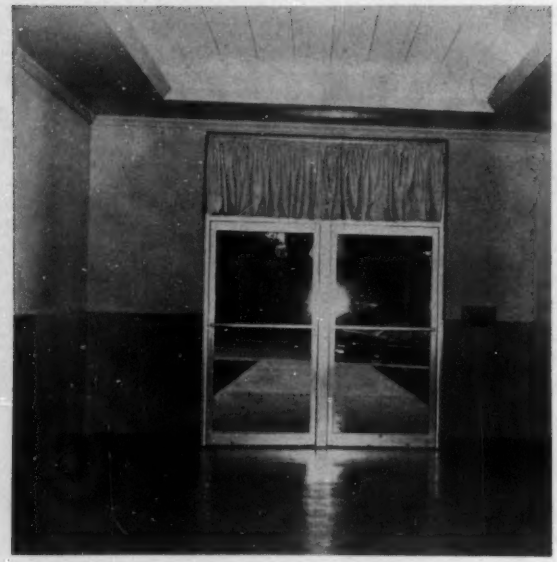
WRITE FOR CONDENSED CATALOG E-240A. GREENLEE TOOL CO., 1954 COLUMBIA AVE., ROCKFORD, ILLINOIS

TOOLS FOR CRAFTSMEN

GREENLEE

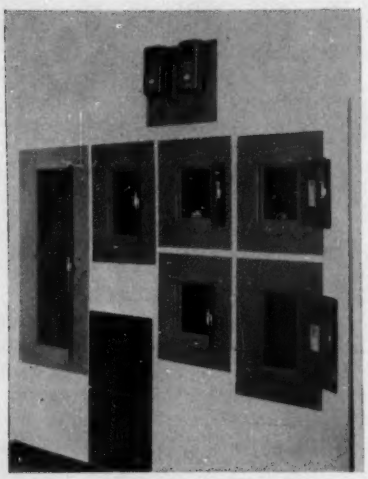
JOB-PROFIT TOOLING

. . . cost control for contractors



Cove lighting and ionix wall heaters are used in both the lobby and hall of the Gribble school in Tennessee.

An ultraviolet germicidal light shines overhead as Mrs. Marcell Stubblefield teaches a class in the school.



This electrical "nerve-center" controls the Gribble Memorial School.

Handicapped children

Included among features

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✓

Electrical facilities help the Gribble school to fill the educational needs of handicapped children who could not otherwise attend classes.

By W. E. Lee, Research and Demonstration Branch, Tennessee Valley Authority

◆ An all-electric school for handicapped children—one man's gift to his community—has been opened in McMinnville, Tenn.

Children who are mentally or physically unable to keep pace in the regular public school system may attend all 12 grades in the Gribble Memorial School. Rehabilitation and adjustment are the twin goals of this school's curriculum.

The donor, businessman and financier Martin Gribble, designed and built this unusual school himself. He drew up the original plans and had the Nashville architectural firm of Louis L. Waller draw up final plans. He also hired local workmen to construct the building and supervised the construction.

To get help with his electrical problems, Mr. Gribble went to Clyde Winters, superintendent of the McMinnville Electric System. Mr. Winters called on the TVA, with whom he has a contract for assistance with commercial and industrial applications of electricity.

Suspended fluorescent fixtures illuminate all classrooms in the school.

Automatic electric unit ventilators such as the one above are used to provide heat for the classrooms as well as for the school auditorium.

can learn at all-electric school

is automatically controlled heating system

C. H. Patterson, a TVA commercial engineer, worked with the architect on the electrical part of the design.

Automatic electric unit ventilators furnish heating for the classrooms and the auditorium. Each classroom is equipped with one 12-kw unit, and there are two nine-kw units in the auditorium. The unit ventilators have automatic mixing dampers and fresh air intakes for forced ventilation. Air is filtered each time it moves through the ventilators.

Units are mounted on the floor by an outside wall, and fresh air enters the unit through an air intake in the outside wall. The result is a combination of circulated heat and fresh filtered outdoor air. These units also provide forced ventilation in hot weather.

The cafeteria and all-electric kitchen are heated by one three-kw and two six-kw ceiling heaters. Halls, the office, clinic, and restrooms are heated with ionix wall heaters. These heaters purify the air by emitting negatively charged ions. The entire heating system is thermostatically controlled to maintain a steady 70 F. A program clock regulates the heating to preset patterns.

The timing system features automatic night setback (55 F) and holiday setback. When the building is to be used at night, an override switch will maintain the heat without disrupting the regular heating program. In the event of extremely low outside temperatures, an automatic override turns on the heat, assuring warm classrooms even on the coldest mornings.

To guard against a power outage disturbing the heating program, the electric program clock has a ten-hour mechanical reserve. When the current is restored, the system will automatically readjust.

Suspended fluorescent fixtures light the classrooms. Cove lighting is used in the lobby and halls. The lighting level is 50 footcandles in the office, recreation room, auditorium, and the three classrooms. There are separate lighting fixtures over each chalkboard. The lighting level is 30 footcandles in the cafeteria, kitchen, and corridor.

Ultraviolet germicidal lamps are placed in each classroom and the auditorium. In the halls are two refrigerated water fountains with remote refrigeration units. All moving parts are concealed in closets, out of the way of students.

The entire electrical wiring system is in conduit. All panels are equipped with circuit breakers — there are no fuses in the building.

From top to bottom, the building was designed with the limitations of its students in mind. The school is constructed of stone, brick, steel, and marble. It is considered completely fireproof.

Three classrooms, plus a combination room with an elevated stage, are the school's activity centers. Since many of the students use wheelchairs, there are no steps. Sidewalks are sloped gradually to the floor level, and a ramp provides access to the stage.

A fully equipped clinic is located in the center of the building to care for children who become ill during the day. At the rear of the building are the kitchen and cafeteria. In all, the building con-

(Continued on page 127)

Application of Code requirements

Class I installations in hazardous locations require certain types of wiring methods with explosion-proof devices and conduit seals

By Walter R. Stone, Contributing Editor on Code Rules, Utica, N. Y.

◆ Article 501 of the Code governs the installation of wiring and equipment in Class I locations.

By the provisions of Section 501-2(a), transformers and capacitors are treated according to whether or not they contain liquid which will burn when installed in Class I, Division 1 locations.

If they do contain liquid which will burn, transformers and capacitors are required to be installed in approved vaults only. Such vaults are required to conform not only with the special provisions for vaults in Sections 450-41 through 450-48 which were discussed in the January issue of this magazine, but also to the following additional provisions:

(1) Doors or other openings between the vault and the hazardous area are prohibited. (2) Sufficient ventilation for complete and continuous removal of hazardous gases or vapors is required. (3) Ducts and vent openings are required to discharge gases or vapors at a safe location outside of buildings.

(4) Ducts and vent openings are required to be of sufficient size to prevent the accumulation of explosive pressures within the vault. And (5) all portions of ducts which are within buildings are required

---

Code test questions

1. Transformers and capacitors installed in Class I, Division 1 areas and which contain a liquid that will burn are required to be installed in vaults which are suitable for use in or adjacent to hazardous areas, but such transformers or capacitors are not required to be of the explosion-proof type. True or false?

2. Transformers and capacitors installed in Class I, Division 1 areas and which do not contain a liquid that will burn are permitted to be either of the explosion-proof type or be installed in vaults which are suitable for use in or adjacent to hazardous areas. True or false?

3. Transformers and capacitors which are installed in Class I, Division 2 areas are required to be of a type approved for hazardous locations. True or false?

4. Meters, instruments, and relays which are installed in Class I, Division 2 locations and in which are incorporated contacts for making or breaking current may be enclosed in a general-purpose enclosure with the contacts immersed in oil or in a chamber hermetically sealed against the entrance of vapors. True or false?

5. Slide-wire contact potentiometers used in conjunction with thermocouples may be enclosed in general-purpose enclosures when installed in Class I, Division 2 locations if the maximum operating temperature of the enclosure does not exceed 80 per cent in degrees Centigrade of the ignition temperature of the gas or vapor involved. True or false?

6. When installed in Class I, Division 2 locations, instrument transformer windings, impedance coils, and solenoids which do not incorporate sliding contacts or make and break contacts are required to be provided with enclosures which:

(a) are explosion-proof.

(b) may be of the general-purpose type where vents adequate to permit prompt escape of any gases or vapors are provided.

(c) have telescoping covers.

Which is correct? a? b? or c?

7. The wiring method in Class I, Division 1 locations is required to be:

(a) rigid metal conduit only.

(b) Type MI cable only.

(c) rigid metal conduit or type MI cable.

Which is correct? a? b? or c?

8. The wiring method in Class I, Division 2 locations is required to be:

(a) rigid metal conduit or type MI cable except where provisions must be made for limited flexibility, such as at motor terminals.

(b) rigid metal conduit, type MI cable, or electrical metallic tubing.

(c) rigid metal conduit only.

Which is correct? a? b? or c?

9. In Class I, Division 1 locations, flexible connections for motor terminals are permitted to be made with:

(a) explosion-proof flexible fittings only.

(b) explosion-proof flexible fittings or liquid-tight flexible metal conduit.

(c) explosion-proof flexible fittings or extra hard usage cord with a grounding conductor.

Which is correct? a? b? or c?

10. In Class I, Division 2 locations, flexible connections for motor terminals are permitted to be made with:

(a) explosion-proof flexible fittings only.

(b) explosion-proof flexible fittings or liquid-tight flexible metal conduit only.

(c) explosion-proof flexible fittings, flexible metal conduit with approved fittings, or flexible cord approved for extra hard usage and provided with approved bushed fittings and a grounding conductor.

Which is correct? a? b? or c?

Correct answers will be found at end of article on page 128.

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to be constructed of reinforced concrete.

Transformers and capacitors which do not contain liquid which will burn are required either to be placed in a vault which complies with the above requirements, or else be of the explosion-proof type.

Transformers and capacitors which are installed in Class I, Division 2 locations do not have any special requirements by reason of location.

Section 501-2(b) states that transformers and capacitors installed in Class I, Division 2 locations shall comply with Section 450-21 through 450-25. The requirements of these sections, however, pertain to transformers only, whereas Article 460 governs capacitors.

Section 460-2 by reference includes Part C of Article 450 which includes Sections 450-41 through 450-48 governing vaults. But the intent of Section 501-2(b) is to require no special treatment of either capacitors or transformers when installed in Class I, Division 2 locations.

Control devices governed

Meters, instruments, relays, instrument transformers, resistors, rectifiers, thermionic tubes, and similar measuring and control devices, when installed in Class I locations, are governed by Section 501-3.

Paragraph (a) of this section requires that such equipment be provided with explosion-proof enclosures if installed in Class I, Division 1 locations.

A fine print note following this paragraph recommends that all such equipment be installed outside of the hazardous area where practicable. It usually is practicable for such measuring and control devices.

The operating switches or push buttons for control relays are usually needed at the site of the equipment to be controlled. But the control equipment mentioned above can be installed outside of the area as a general rule.

Paragraph (b) of Section 501-3 specifies less strenuous requirements for this equipment when installed in Class I, Division 2 locations.

For Division 2 areas, meters, instruments, and relays which have make or break current contacts, if not in explosion-proof enclosures, are required either to be in general-purpose enclosures with all contacts immersed in oil, or to be in enclosures which are hermetically sealed against the entrance of gases or vapors.

Resistance devices, thermionic tubes, and rectifiers which are used in connection with meters, instruments, and relays are required to have explosion-proof enclosures, even in Division 2 locations, except as follows:

Equipment (1) which does not have make or break contacts or which does not have sliding contacts other than slide-wire contacts in potentiometers which are used in conjunction with thermocouples; and (2) which does not operate at temperatures exceeding 80 per cent in degrees Centigrade of the ignition temperature of the gas or vapor involved.

Transformer windings, impedance coils, solenoids, and similar windings which do not have make or break contacts or sliding contacts, if not in explosion-proof enclosures, are required to have suitable enclosures, which may be of the general-purpose type, with sufficient vent openings to allow for prompt escape of any gases or vapors.

An assembly of meters, relays, instruments, and associated equipment may be enclosed in a single common enclosure provided that the enclosure so used for the assembly would be acceptable also as an enclosure for each of the individual components.

Wiring method

The wiring method in Class I, Division 1 locations is required by Section 501-4(a) to be either threaded rigid metal conduit or type MI cable. All boxes, fittings, and terminal connections associated with either wiring method are required to be of the threaded type and approved for Class I, Division 1 locations.

At least five full threads are required for all threaded joints. Type MI cable is required to be free from tensile stress at terminal fittings. Where flexible connections are necessary, explosion-proof flexible connectors approved for the location must be used.

Wiring in Class I, Division 2 locations is required by Section 501-4(b) to be rigid metal conduit or type MI cable with fittings approved for Class I locations, just as in Division 1 areas.

However, where flexible connections are necessary in Division 2 areas, flexible metal conduit with approved fittings or extra hard usage flexible cord with a grounding conductor and approved bushed fittings may be used as well as the explosion-proof flexible connectors which are required in Division 1 areas.

Seals required

Seals are required for Class I locations by Section 501-5 in type MI cable terminals as well as in raceways. In type MI cable, the seals prevent the entrance of gases and moisture from seeping into the insulation.

In raceways, seals prevent the passage of explosive gases or vapors from hazardous areas to non-hazardous areas where they could be ignited by arcing devices or by other means. If they should be so ignited, the explosive gases or vapors in the raceway system would act as a pilot and carry the flame back to the hazardous area. The results of this could be catastrophic.

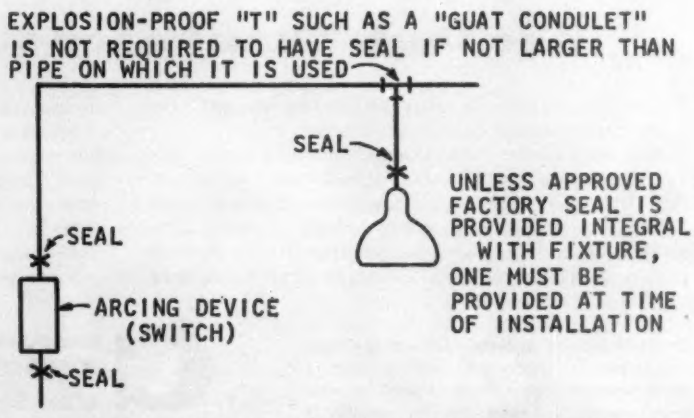

Fig. 1—In Class I locations, seals are required in all raceways entering or leaving any type of device which may produce arcs, sparks, or high temperatures. Such seals are to be as close as practical and may not be located more than 18 inches from the enclosure.

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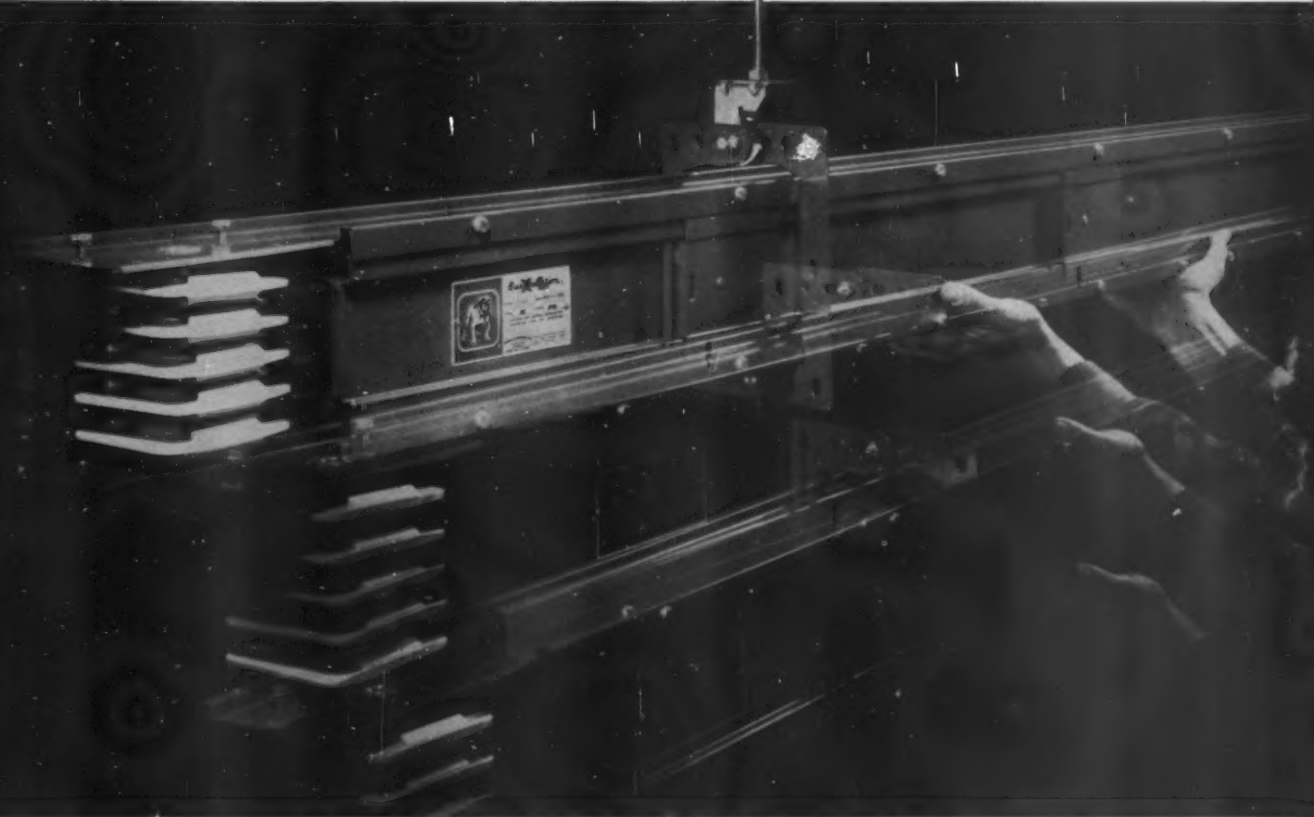

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CONDUITS SMALLER THAN 2" IN TRADE SIZE ARE NOT REQUIRED TO HAVE SEALS ON JUNCTION BOXES
JUNCTION BOX
CONTAINING SPLICES, TAPS, OR TERMINALS
2" CONDUIT OR LARGER
SEAL
2"CONDUIT OR LARGER
SEAL

Fig. 2—Seals are required in raceways of two-inch size or larger where they enter or leave junction boxes. Pull boxes which do not have splices, taps, or terminals are not required to have seals in any size pipe. Seals are required to be as close to the enclosure as possible and at most cannot be located over 18 inches from the enclosure.

Seals can be used also to prevent pressure piling. This occurs when an initial explosion in one end of a section of vapor filled raceway is followed by additional explosions inside the same raceway as each successive explosion ignites additional gases further along. Each such successive explosion is more powerful than the one before it.

Where this occurs in long runs, the explosive pressures can build up until the raceway is ruptured. As it ruptures from such an exploding force, the surrounding hazardous area is subjected to the hot flames. The results of this can be catastrophic, also.

Pressure piling prevention

The placing of sealing fittings at frequent enough intervals in long raceways would prevent pressure piling. At present, the Code does not require that seals be used for this purpose.

The principal reason is that the explosion of gases inside of raceways can be almost entirely eliminated by the proper placement of seals on each side of arcing devices so that the raceway gases cannot be ignited by such arcing devices.

Gases inside of raceways can then be ignited only (1) in the event of faulty sealing at arcing devices and (2) by a fault in the raceway wiring.

Some designing engineers consider these two possible sources of ignition sufficient cause to justify the small additional expense of installing additional seals at frequent intervals (usually at 50-foot intervals) in long conduit runs.

Manufacturers of seal-off fittings someday, perhaps, will test all sizes of steel and aluminum conduits to determine maximum distances which would be safe to run without intervening seals in each size for most commonly encountered petroleum gases, if not for other types of gases as well. A recommended table could then be made available for those who desired to make use of it.

Such a study might reveal a need for Code recognition of additional seals. The seals now required by the Code for Class I areas are stipulated in Section 501-5.

Paragraph (a) of this section specifies that for Division 1 areas a seal-off fitting is required to be placed as follows:

(1) In each conduit run entering or leaving an enclosure for any type of device or apparatus which may produce arcs, sparks, or high temperatures, such as switches, relays, fuses, resistors, etc. See Figure 1.

Such seals are required to be as close as practicable, and in no case more than 18 inches from such enclosures. Fixtures which are approved for Class I locations usually are sealed by the manufacturer.

(2) In each conduit run of two-inch size or larger entering an enclosure or fitting which houses terminals, splices, or taps. A junction box would be included in this category. See Figure 2.

A pull box, however, where there are no splices, taps, or terminals, would not be required by the Code to have a seal in any size raceway entering or leaving the box. A fine print note further states that ordinary conduit fittings, such as a "T," an "L," or a cross, if not larger than the conduit size, would not be classified as an enclosure and therefore would not require a seal.

I might add here that "ordinary" fittings of this type must be of the explosion-proof design and be approved for the location. Therefore, the term "ordinary" as used in this fine print note could be misleading. See Figure 1.

Single seal permitted

Where two enclosures are connected by conduit not more than 36 inches in length, a single seal is permitted in the short raceway connecting them if it is placed in the center, or so that there are not more than 18 inches of raceway between the seal and either enclosure. See Figure 3.

This rule applies to all types of enclosures requiring seals and not just to enclosures housing terminals, splices, or taps. Other conduits entering or leaving the same enclosure would not be affected in any way by the common seal in a short raceway serving two enclosures.

(3) In each conduit run entering or leaving the Class I, Division 1 area. The seal may be on either side of the area boundary, but no

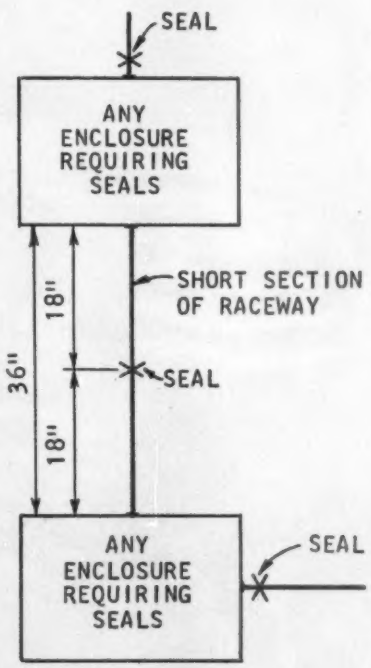

Fig. 3—One common seal is permitted for two enclosures when connected by a short section of raceway not exceeding 36 inches in length, if the seal is so placed that it is not more than 18 inches from either enclosure. Other raceways entering the same enclosures require their own seals where needed.

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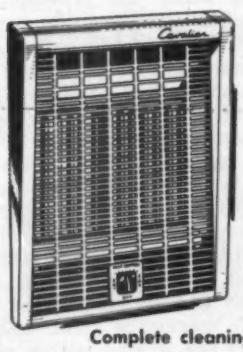

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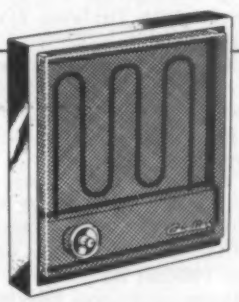

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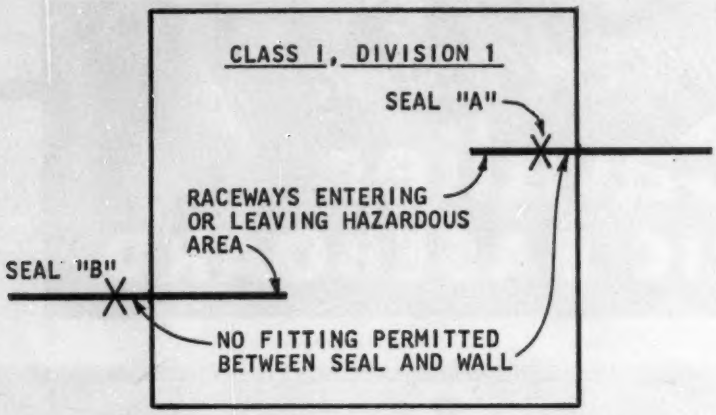


Fig. 4—Seals are required in all raceways entering or leaving hazardous areas, and may be put either inside of the hazardous area, as at "A," or outside, as at "B." But never can there be any box, coupling, union, or fitting between seal and boundary of hazardous area.

union, coupling, box, or fitting is permitted in the conduit between the seal and the boundary of the Class I, Division 1 area.

The seal is required to be installed in such a manner that any gases or vapor which may enter the conduit within the hazardous area cannot be transferred or communicated to the area beyond the Class I, Division 1 boundary. See Figure 4.

Division 2 requirements

Sealing requirements for Class I, Division 2 are specified by Section 501-5(b) and are the same as those discussed above for Division 1 areas. All wiring in Division 2 areas between seals and enclosures and between seals and Class I, Division 2 boundaries are required to comply with Division 1 wiring requirements.

Section 501(b-2) actually specifies that rigid conduit be used between the sealing fitting and the point at which the conduit leaves the hazardous area.

The intent here, however, is not to prohibit the use of type MI cable in Division 2 areas, but to require that, if a raceway is used, it be rigid conduit between the sealing fitting and the Division 2 boundary. The same requirement for rigid conduit is specified between seals and enclosures by Section 505-5(b-1).

Where seals are required in either Division 1 or Division 2 areas of Class I locations, Section 501-5(c) requires that such seals conform with the following minimum standards:

(1) Sealing fittings are required to be approved for Class I locations. Sealing fittings which are an integral part of an enclosure are acceptable if approved for the purpose.

(2) Sealing compound is required to be approved for the purpose and be of a type which is not affected by the surrounding atmosphere or liquids. The melting point is required to be not less than 93 C (200 F).

(3) The sealing fitting is required to be so designed that the compound in the completed seal will have a minimum thickness of not less than the trade size of the pipe and in no case less than 5/8 inch. See Figure 5.

(4) Splices and taps are not permitted to be made in sealing fittings. Other fittings which contain splices or taps are not permitted to be filled with sealing compound.

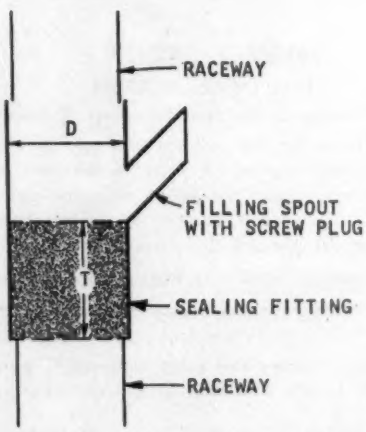


Fig. 5—Sealing compound thickness "T" is required to be not less than trade size of pipe diameter, "D," and in no case less than 5/8 inch.

(5) In an assembly enclosure where equipment which may produce arcs, sparks, or high temperatures is in a compartment which is separate from a compartment containing splices or taps, and an integral seal is provided where the conductors pass from one compartment to the other, the entire assembly and its enclosure is required to be approved for Class I locations.

If raceways two inches or larger enter the compartment containing splices or taps, seals are required for such raceways. Seals are required for raceways of any size conduit entering the compartment containing the equipment which may produce arcs, sparks, or high temperatures.

Drains necessary

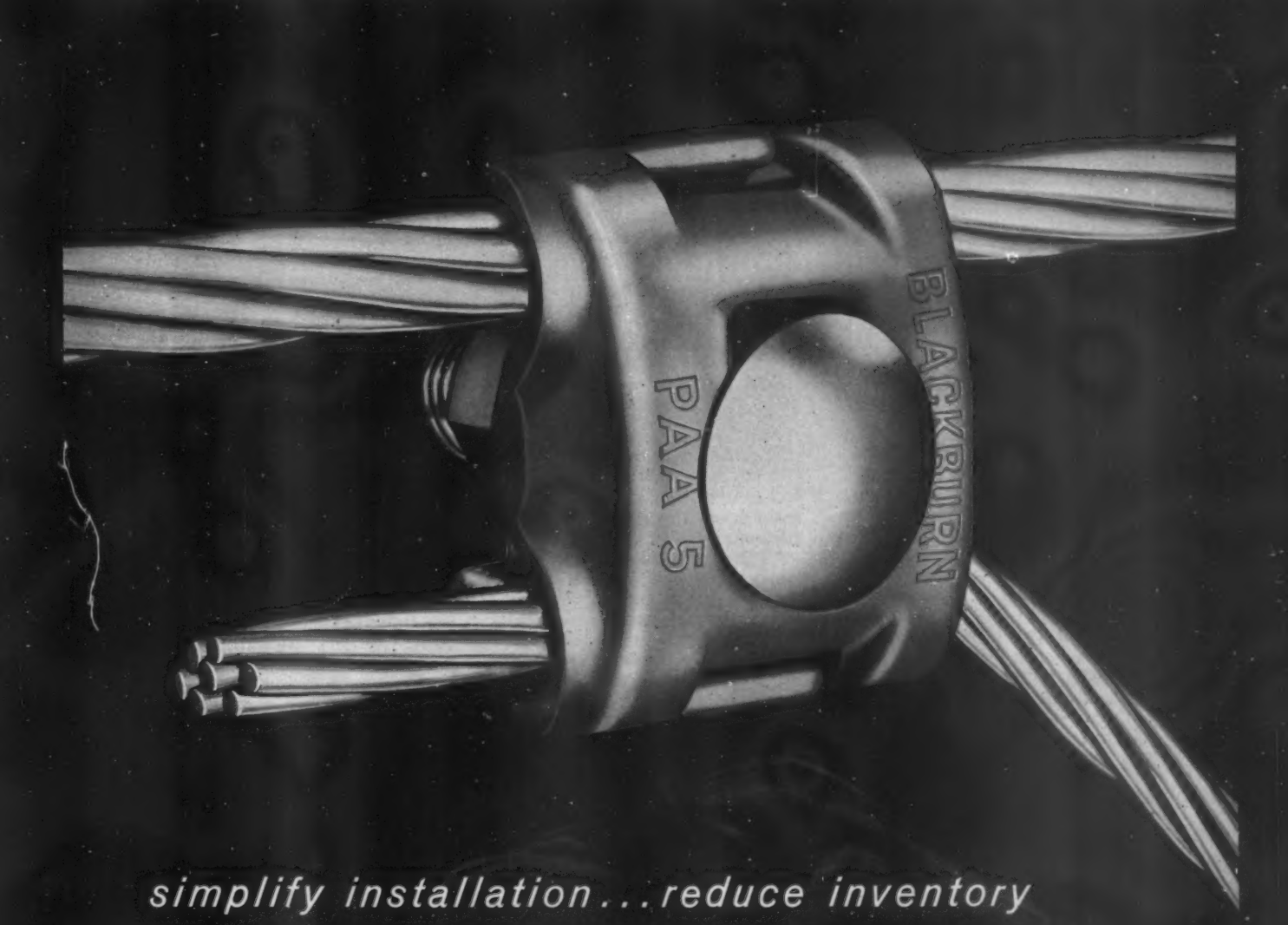
Enclosures and raceways which are sealed off and in which there is a possibility of condensation are required to be provided with drains approved for the purpose. Enclosures which are provided with drains should be provided also with approved vents. Drains in enclosures which are not provided also with vents are not efficient.

Raceways and all associated wiring are required to be arranged to minimize the entrance of liquids into motor or generator enclosures. Where the Code enforcement authority judges there to be a probability of condensation within motors and generators, he can require that only motors and generators be used which are provided by the manufacturer with approved integral means of preventing such accumulations of moisture.

A great deal has been said here about gases and vapors entering conduits and enclosures in hazardous areas and about drains and vents for enclosures. For those who are not familiar with explosion-proof equipment, it might be well to state here that such equipment is not vaportight. Vapors, gases, and liquids can and do enter such raceways and enclosures. They are ignited within some enclosures, such as switch enclosures; and when so ignited, they explode. After the explosion, the gases escape back into the atmosphere.

The enclosures in which such explosions occur, however, are strong enough to withstand and to contain the explosion. The hot gases, on escaping after the ex-

(Continued on page 127)



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Contractors tell how

Small repairs bring profitable jobs to half-century old contracting firm

◆ "Small repairs lead to profitable projects," says Walt Drown of Willis Electric in Sarasota, Fla., the oldest electrical contracting firm in the city, with a record of a half century of experience behind it.

It might seem that the electrical contractor involved in jobs of major proportions would skid profitwise doing small and odd jobs of regular or emergency repair work. And each job is an "emergency" to the customer, even if it means only the replacement of a cord in an electric iron.

Minor jobs for a refrigeration company resulted in Willis getting wiring subcontracts for an extensive civic building air conditioning job.

Such work is not always unprofitable, according to Mr. Drown, who will not hesitate to call a man from a large project to make a small repair for a harassed customer.

"Take an outfit like one of our bank customers," says Mr. Drown. "If you ignore their petty jobs, they'll ignore you on their major revamping and expansion jobs.

"If you don't keep them happy by doing their small jobs, you're sure to lose out on their big work." Which means that should a bank phone in about a nonworking coffee percolator, the Willis shop will fix it in a hurry.

Mr. Drown's feeling is that minor jobs develop the customer's confidence in his firm and when the bigger jobs come along, Willis is in the best possible position to get them in the face of competition and such jobs may often be landed without competition.

For example, it is Willis' practice to send a man a considerable distance to motels, located at the beaches, just to change a fluorescent tube or repair a bell. For the owner of one such motel the Willis firm has done thousands of dollars worth of wiring.

Similarly, Willis has been known to do many a trifling job for area builders, either at their homes or their job sites, jobs which one might view as profitless undertakings. Yet these same builders are responsible for awarding Willis some fine electrical construction contracts, such as a recent $18,000 bank job.

For a number of years Willis performed minor chores for a commercial refrigeration company, such as installing a single outlet for a window air conditioner. But when that company got involved in an extensive air conditioning job in the revamping of a large civic building, they saw to it that Willis received a substantial contract.

Says Mr. Drown: "Our firm has a sort of 'give it away' gimmick in which Dick Willis believes because it fosters goodwill with other contractors, avoids hassles, and forestalls hard feelings with other trades on the job."

For instance, if the wiring happens to go to one contractor while Willis lands the air conditioning, he's just as apt to turn that air conditioning part of the job over to the wiring contractor. Mr. Willis refrains from going on a job where another contractor in his trade is working.

"Otherwise," he says, "you may run into problems as to who finishes where and who starts what. Or you run into mixed interpretations of plans, such as an argument over a pipe chase and who belongs to it or its installation.

"Or the other guy may set up and mount a switch for the air conditioning unit and omit the fuses, or deny responsibility for some error of omission and attribute this to the air conditioning contractor's shortcomings, etc."

In many cases, when Mr. Willis is called to do a job at a site where another electrical firm is involved in work, he will delay going on that job until the other contractor has left it.

This might seem like a peculiar stand to take in today's keenly competitive electrical business, but the Willis firm has been around for half a century.

Mr. Willis recently landed the contract to rewire the ancient John Ringling residence. As each old panel box was opened, therein was seen the name of his father, who had wired the fabulous mansion many years ago.

Conference room helps contractor in selling lighting

◆ A paneled conference room featuring great flexibility in the quantity and quality of light obtainable is used as a lighting sales tool by G. A. Rafel & Co., a Chicago firm of contracting electrical engineers.

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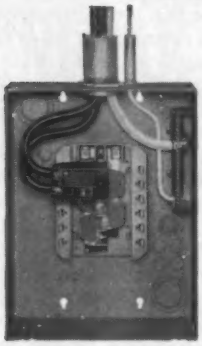
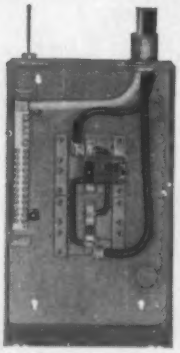
It's a main disconnect... It's a subfeed...



Plug in new TQAL breaker in usual manner on load centers rated 125-200 amps, then *backfeed* by connecting line conductors to breaker terminals. TQAL now acts as main disconnect for entire service; current to remaining breaker positions cannot exceed rating of TQAL.

Cat. No. TRP1212



Plug in new 70-amp TQAL breaker on devices rated 125-200 amps; new 100-amp TQAL on devices rated 200 amp, then connect subfeed load conductors to breaker terminals. The TQAL is now a "SUB-FEED MAIN" for separate branch controlling heat pump, heat panel, etc.

Cat. No. TRP1220

It's General Electric's new TQAL circuit breaker!

70 and 100 amps, 2 poles, 120/240 volts a.c. U/L listed

Just plug it in and save the cost of separate main disconnect enclosures

Two new plug-in circuit breakers now add even greater versatility to the General Electric "TWIN"* load center line. Both are designed on the same one-inch modulus as all G-E plug-in breakers, so you can plug them in *anywhere* on the bus ("TWIN" load centers are sequence-phased). Both poles trip automatically when a fault occurs on either one.

In G-E load centers rated 125 amperes and above, these new TQAL breakers will bring you real savings wherever main disconnects are required. Write for Bulletin GEA-7071.

**Trademark*

MEDALLION HOME — LIVE BETTER ELECTRICALLY

PROTECTING MEDALLION HOMES EQUIPPED BY GENERAL ELECTRIC

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.

For more details on above items, use reply card on page 27

With all 129 fluorescent and incandescent lamps operating, this conference room is lighted to its peak level — 500 footcandles. Featuring great flexibility, the system is employed to show many types of lighting to potential customers, and serves as a valuable sales tool for lighting.

his conference room's lighting is the most versatile in the electrical contracting business.

Low-voltage controls provide for the demonstration of incandescent and fluorescent lighting systems both independently and together. The mood of the room can be changed quickly to complement the activities of persons occupying the space.

A general lighting level of 500 footcandles, more than ten times as high as prevails in the average business office, is available from General Electric light sources when all circuits are activated.

Most lighting elements are mounted in a floating ceiling of acoustical tile. Over the conference table is a large luminous panel, which conceals 27 40-watt cool white rapid - start fluorescent lamps, and 12 eight-foot Power Groove fluorescent lamps behind two- by-two-foot Holophane prism panels. The 40-watt lamps are operated by one circuit, and the Power Groove lamps on three circuits.

Six 150-watt spot lamps are aimed at the conference table, six 75-watt spot lamps at a small stage, and two 20-watt lamps illuminate pictures on the walls.

Perimeter lighting around the floating ceiling features 76 40-watt fluorescent lamps in four rows, one each of cool white, pink, blue, and gold. Concealed by panels of luminous plastic, they bring out the texture of the antique birch paneling, and make possible a variety of color effects.

Except for the Power Groove lamps, all fluorescent and spot lamps are dimmer controlled.

To supply power to the lighting systems, 50,000 feet of wiring is employed. The 109 ballasts are located remotely to reduce the load on the room's air-conditioning system, which is thermostatically controlled.

In addition to the conference room, lighting systems in the Rafel offices and warehouses also are designed as effective lighting demonstration areas.

Contractor's ideas often better job

By Conrad Paysour, Electrical South Field Editor, Lincolnton, N. C.

◆ Should an electrical contractor follow plans for a job exactly, to the most minute detail?

R. W. (Red) Ramsey, an electrical contractor in Gaffney, S. C., does not think so—if you have ideas of your own which you think can improve the job and if you can convince the person for whom you are doing the job that these ideas are good.

"I always think of my work as a hobby. I like it and take an interest in it," says Mr. Ramsey.

"If you can make a fellow see

(Continued on page 126)

Troughs enclosed in cabinets, installed at the suggestion of the contractor, eliminate unsightly conduits and protect wiring against grease-caused damage in this large new South Carolina restaurant kitchen.

I-T-E ENGINEERS DESIGNED UNI-PAK LOADCENTERS FOR FAST, EASY INSTALLATION!

■ Box, interior and trim are packaged separately for complete flexibility!

The basic idea behind the I-T-E Uni-Pak Loadcenter is *separate packaging!* It eliminates the necessity of tying up working capital in panels for long periods of time . . . allows the contractor to buy the box, interior, and trim separately . . . and to install each of the units separately, or all at once, as he desires.

The concept offers contractors maximum flexibility and panelboard type construction. The same box will hold a wide variety of fusible *or* circuit breaker Loadcenter interiors. Example: the 24-inch box will take more than 50 different interiors.

Time studies PROVE Uni-Pak Loadcenters go in faster! If you have had an opportunity to time the installation of an ordinary loadcenter and the installation of an I-T-E Uni-Pak Loadcenter, you know the Uni-Pak goes in much faster! You can buy your Uni-Pak box, rough-it-in and add the interior and trim as the job progresses.

All Uni-Pak Loadcenter boxes have a standard 14¼" width and fit snugly between 16" stud centers. Quarter-inch knockouts on each side of the box allow fast, easy mounting. Installation is a one man job. There's no trouble. The job is done in seconds!

There's no need to build-up the stud side with scrap lumber when you put in a Uni-Pak. The 14¼" Uni-Pak box nestles tightly between stud centers. Nails or screws hold it solid.

Once the box is in place, you simply **hang** the interior much the same way you hang a picture. Since many different **fusible or circuit breaker** type interiors fit into the same box, you can select a single main disconnect, a split bus, a main lugs only Loadcenter, or any one of the special application devices. You have complete flexibility.

No "plastered plugs!" Result? No time lost . . . no damaged interiors!

Separate packaging protects your investment. The simplicity and versatility of the Uni-Pak design has made it one of America's foremost Loadcenters!

THIS! NOT THIS!

Adding trim is a cinch! There is no need to fit the trim around fuse blocks or circuit breakers, or adjust for irregularities in the walls. I-T-E Uni-Pak Loadcenters have a standard 4" depth, fit perfectly into dry wall construction.

The Uni-Pak Loadcenter has the only true, flush trim and can easily be built flush to the wall. When "painted in," the I-T-E Uni-Pak Loadcenter is almost invisible.

Write for Bulletin B-62 today! For complete information, write I-T-E Circuit Breaker Company, Walker Division, 125 Bennett Street, N.W., Atlanta 9, Georgia. Ask for Bulletin B-62.

The HEART of HOUSEPOWER ⚡ Nerve-Center of the Medallion Home

I-T-E CIRCUIT BREAKER COMPANY
WALKER DIVISION

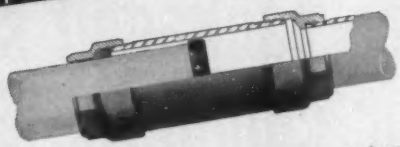
For more details on above items, use reply card on page 27

in the long run... it's O.Z.

Type AX

Provides 4" expansion, contraction movement. Malleable iron head, body Hot Dip Galvanized. Weatherproof head sealed by factory-installed high grade graphite packing. Insulating conduit end bushing eliminates cable abrasion. 10 sizes for conduit ½" to 4" diameters.

Type EX



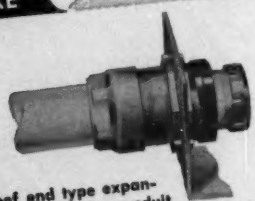
Permits 8" conduit movement. Optional length sleeves, additional cost. Weatherproof head sealed by factory-installed high grade graphite packing. Insulating bushings prevent cable abrasion. Hot Dip Galvanized finish. 12 sizes for ½" to 6" conduit diameters.

Type DX

Patented

Compensates for deflection, expansion, contraction. ¾" movement all directions from normal; 30° angular movement. Also used as vibration damper between conduit sections. 10 sizes. Watertight (NEMA 4) and submersible under 25 ft. head of water.

Type EXE



Weatherproof end type expansion fitting. Designed for conduit terminating in junction box, where expansion, contraction take place. Supplied complete: locknuts, bushings. Standard finish, Hot Dip Galvanized. 12 sizes.

Type TX

Similar to the Type AX, this unit is supplied complete with extension nipples, ready to receive thin wall couplings. Standard finish is cadmium plated. Available in 6 sizes for conduit ranging from ½" to 2".

for the longer line of EXPANSION FITTINGS

In the long run, no line of conduit is more dependable than its components. When it comes to dependability in expansion fittings, look to O. Z. as the line that measures up! Five basic types provide the dependable answer to your fitting problems in conduit expansion, contraction, and deflection. O. Z. is the dependable line because it's the line with the *right size*, the *right type*, for every requirement! Types AX, DX, EX and EXE available in aluminum at no extra cost.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
- INTERLOCKED ARMOR CABLE FITTINGS

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • ESterbrook 9-0326
Office and Factory: 749 Bryant Street, San Francisco 7, Calif. • GArfield 1-7846

It took contractors a short two and a half years to catch up with the output of the first CIRTUBE EMT mill. Now, a second mill, just recently put into operation, helps meet expanding contractor needs.

Reason for CIRTUBE's quick success? Consistent high quality—from tube to tube, bundle to bundle, month to month—the same easy fishing and bendability, the same good looks. That ...and fast, friendly Circle service.

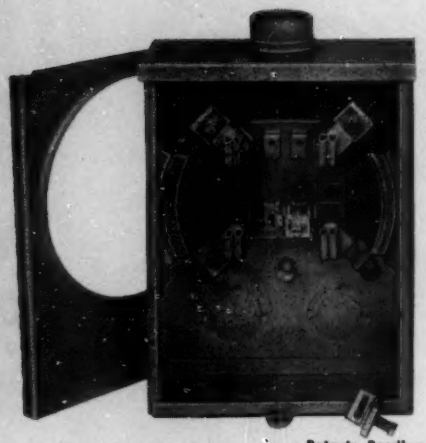
If you're not yet a CIRTUBE EMT user, be sure to try it on your next job. You...and your men ...will like working with it.

CIRCLE WIRE & CABLE CORP.

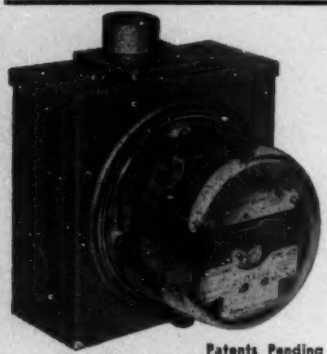
SUBSIDIARY OF **CERRO CORPORATION**

PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities.
Rubber Covered Wires & Cables • Varnished Cambric Cables • Plastic Insulated Cables • Neoprene Sheathed Cables • "CIRTUBE" EMT

I T B M *Ask for it!*



Patents Pending
CATALOG SL-AL-100FH-1 1/4"
Size 10 1/2" x 8" x 3 5/8"
4 Terminals—100 to 120 Ampere
Aluminum Extruded Connectors



Patents Pending
CATALOG WV-011-A-1-1/4"
Size 8" x 8" x 3 5/8"
4 Terminals—100 to 140 Ampere
Standard Copper Connectors

LOOKING for Something? Designed for the Application

B & C'S ORIGINAL RINGLESS METER SOCKETS

LIGHT DUTY, MEDIUM DUTY, HEAVY DUTY SOCKETS

SINGLEPHASE, POLYPHASE, COMBINATION DEVICES

HORIZONTAL GANG, VERTICAL GANG, SOCKET UNITS

INDOOR AND OUTDOOR TRANSFORMER CABINETS

COMBINATION TRANSFORMER - METER ENCLOSURES

UNIQUE TRANSFORMER MOUNTING BRACKETS

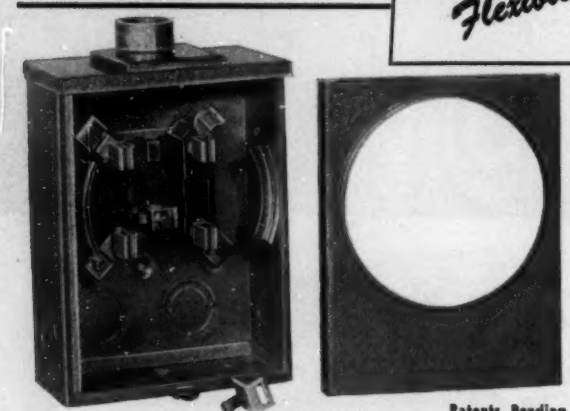
OUTDOOR AND INDOOR METERING ENCLOSURES

SERVICE MAST CLAMPS AND OTHER ACCESSORIES

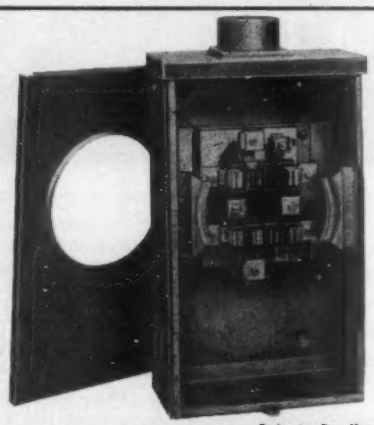
INDOOR AND OUTDOOR METER CONNECTING CABINETS

METER SOCKET ACCESSORIES, PARTS, SPECIAL DEVICES

B & C's Revolutionary, Unique, Designs Flexible, and Unexcelled in Performance Keeping Pace With the Electrical Industry



Patents Pending
CATALOG WVL-AL-0100A-1 1/4"
Size 10 1/2" x 8" x 3 5/8"
4 Terminals—100 to 120 Ampere
Aluminum Extruded Connectors



Patents Pending
CATALOG WVHDP-AL-2007A-2"
Size 17" x 10" x 5 1/2"
7 Terminals—150 to 200 Ampere
Aluminum Extruded Connectors

B and C

Your Seal of Dependability and Safety

Write for descriptive catalog containing installation data and current price list.

METAL STAMPING COMPANY

590 MEANS ST., N. W. • ATLANTA, GEORGIA

UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

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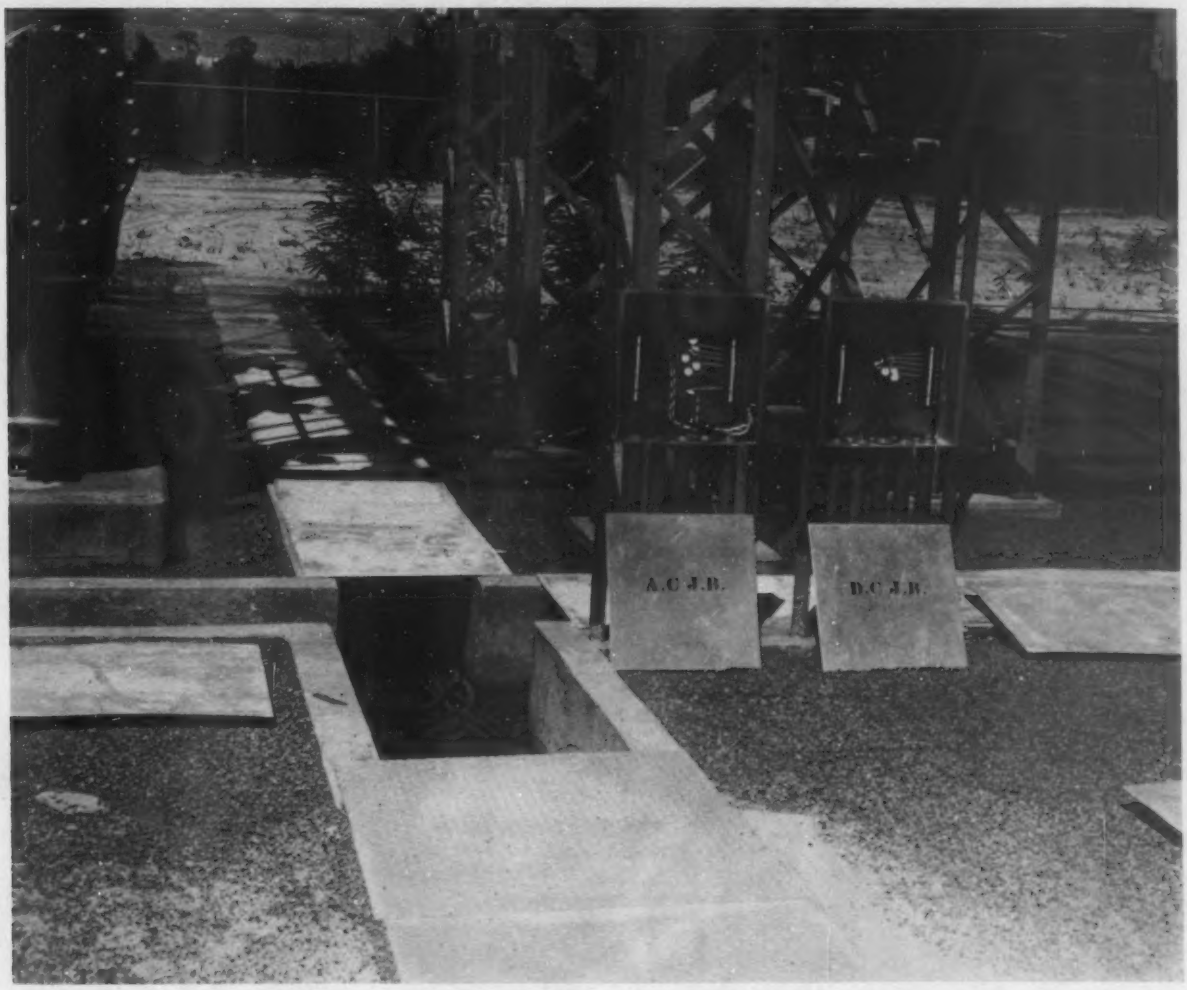
Maintenance



A utility has found that troughs facilitate changes in control cable arrangements—page 82

Substation control cable troughs—page 82

Transformer housings for UG service—page 86

Designs for substation ground resistance—page 90

New electric utility products—page 98

Precision

How Precision's exclusive qualities make multiple lighting control **99% fail-proof**

This engineer uses a jeweler's glass for his final inspection of every Precision photocontrol. Other Precision engineers use ageing chambers, comparators, endurance and hardness testers, oscilloscopes and weatherometers — plus devices originated by Precision for "breakdown" testing of lighting controls — to insure Precision performance at sixteen separate quality control points in our labs.

It is their attention to perfection that makes Precision photocontrols so nearly fail-proof that Precision-equipped multiple lighting systems need only 1% controls replacement in any given year. That is a fact, proved on the lines of major utilities a half million times every day. This perfection results from built-in Precision distinctions that set this control apart from all complex, old-style photocontrols.

Superior materials

Precision uses the industry's largest gold electrode cadmium sulfide cell and gives it total area exposure since both shading and shielding reduce the efficiency of any photocell. Precision makes and uses the only bimetal switch metallurgically-balanced specifically for lighting control. Then Precision adds special pre-fabrication techniques possible only in the world's largest laboratory devoted entirely to multiple lighting controls: measured-atmosphere ageing, heat treating, electronic-measurement of switch calibration accuracy. No other company can invest so much skill in **every** control.

Advanced engineering

Precision gave multiple lighting its "reliability breakthrough" five years ago and continues to lead the field with the only control designed, engineered and developed for one purpose — precise regulation of artificial lighting twice each day through rigid and unfailing response to natural light levels. Other controls are adaptations from obsolete tube-type controls containing up to 18 fragile components. Precision controls have only 2 components. Precision engineering eliminates all inherent fail-out hazards of capacitors, contact balances, magnetic relays, rectifiers, sensing flexible leads, tubes and printed circuits.

Laboratory production

Precision controls are built entirely by technicians, to insure the human-eye responsiveness with all-weather durability demanded in multiple lighting control. Major utilities in every geographical region of North America have contributed field-engineering recommendations during the past four years that have made these controls virtually fail-proof on 400,000 installations. They will utilize the expanded production facilities of Precision to put thousands more of these perfected controls on the line in 1961.

Field service engineers

Because Precision controls are used on more different installations than any other tubeless control, our field engineering representatives have unique experience in automatic control of multiple systems under all conditions. They are your ablest advisors in matching this perfected control to your most specific demands of weather, surge, lightning or light levels.

Write or wire today for data and quotations.

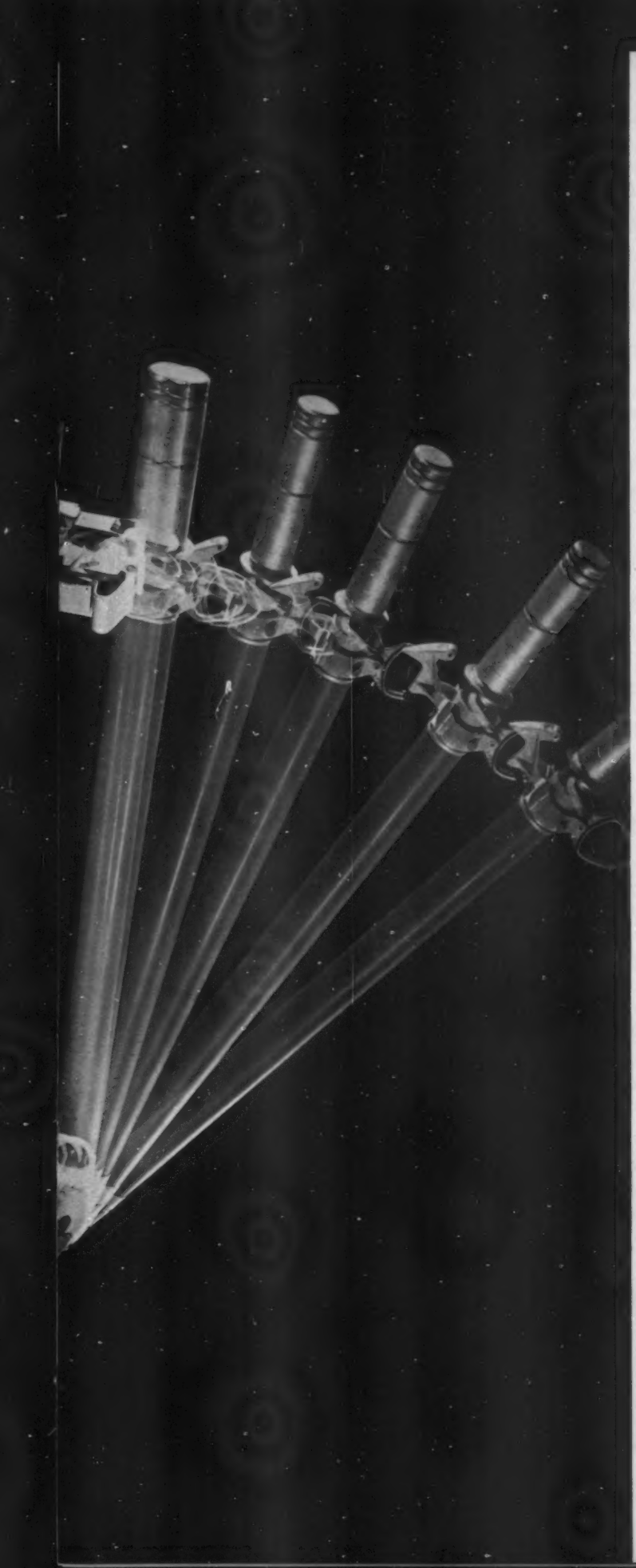
PRECISION MULTIPLE CONTROLS, INC. • Ridgewood, New Jersey

The difference between night and day

NOW 2,000,000 kva

CO_2 gas bomb—insures arc extinction on lowest faults
Fixed boric acid cakes—cemented to inner fibre liner—provide large bore for high faults
Expellable boric acid cakes provide minimum diameter bore for effective interruption of medium-to-low faults
Frangible retaining disc supports expellable boric acid cakes. The blast action of high faults ruptures the disc and expels the inner cakes. The resultant larger bore reduces internal pressures and exhaust gas velocities
Fusible element—nondamageable construction

SMD—2B FUSE UNIT



100% higher interrupting ratings for S&C Power Fuses... and confirmed by test

This new performance level means you can now use power fuses on power transformers tapped onto transmission and subtransmission lines—even where faults may run as high as 2,000,000 kva. Now you can have power fuse protection of small-to-medium transformers in even more places on your system. You have more opportunities to get the benefits of S&C Power Fuses: low-cost, maintenance-free protection against primary and secondary faults, without momentary interruptions on the line.

All this is made possible by S&C's new SMD-2B Power Fuse, which uses a new principle in boric acid circuit interruption, explained on the opposite page.

Behind these new ratings* is a three-year program of laboratory and field testing, culminating in the heaviest faults ever deliberately applied to a power fuse. At the KEMA laboratories at Arnhem, the Netherlands, a power fuse (S&C's SMD-2B) for the first time successfully and repeatedly cleared line-to-line faults of 2,000,000 kva magnitude.

For complete information, write for Descriptive Bulletin 261.

*New ratings established by test

Voltage Rating	Interrupting Rating, Kva 3-Phase Symmetrical	
Kv	New	Old
34.5	1,500,000	1,250,000
46	1,750,000	1,250,000
69	2,000,000	1,500,000
115	2,000,000	1,000,000
138	2,000,000	1,000,000

S & C ELECTRIC COMPANY

4441 Ravenswood Avenue • Chicago 40, Illinois

Specialists in High Voltage Circuit Interruption since 1911

S&C

In Industrial and Commercial Installations...

WAGNER®
SUB URBAN
PAD MOUNTED TRANSFORMERS

conserve space and eliminate costly, ugly enclosures

When you plan a new distribution substation, or rework or modernize an existing system, write Wagner® Sub-Urban pad mounted transformers into your standards. They are contained in compact, tamper-proof housings that make costly, ugly, fenced enclosures unnecessary. Save space, too. They're so well ventilated they can be installed up close to the building and still be loaded to capacity. Some low shrubbery will hide them neatly ... the good looks of your buildings and landscaping are retained. People who use the buildings served by pad mounted transformers are protected from exposed hot-lines, and your crews are protected by a door over the primary compartment which lets them work on the secondary without danger from high voltage. Enclosures lock tightly to protect the equipment itself.

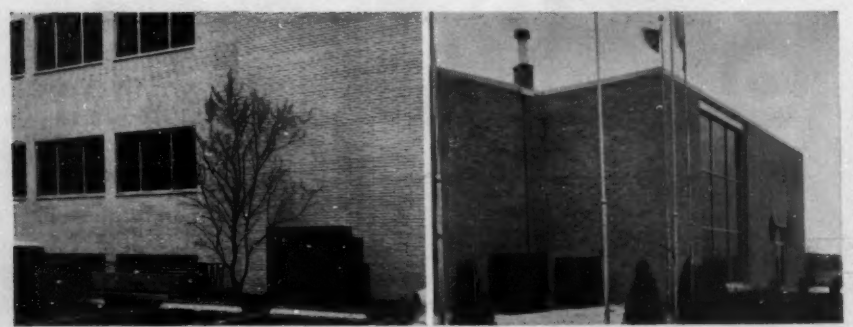
Wagner Sub-Urban pad mounted transformers are available in single-phase, 25-167 kva; three-phase, 75-750 kva. They require only routine maintenance, and when load growth makes it necessary, larger transformers can be quickly and easily installed to replace original units.

Check with your Wagner Sales Engineer. He's got complete data on Sub-Urban pad mounted transformers.. all the facts and figures that prove how easy it is to plan less costly, space-saving transformer installations.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6440 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI



This Wagner Sub-Urban transformer is installed at the Park Ridge, Illinois, executive offices of the Square D Company. It is a 500 kva, three-phase delta-connected, 4160 volt primary transformer.

These transformers serve the Dorchester Club in Dolton, Illinois. The larger transformer supplies power to refrigerate an indoor skating rink. The smaller unit powers the club's general services and all-electric kitchen.

WT61-3

For more details on above items, use reply card on page 27

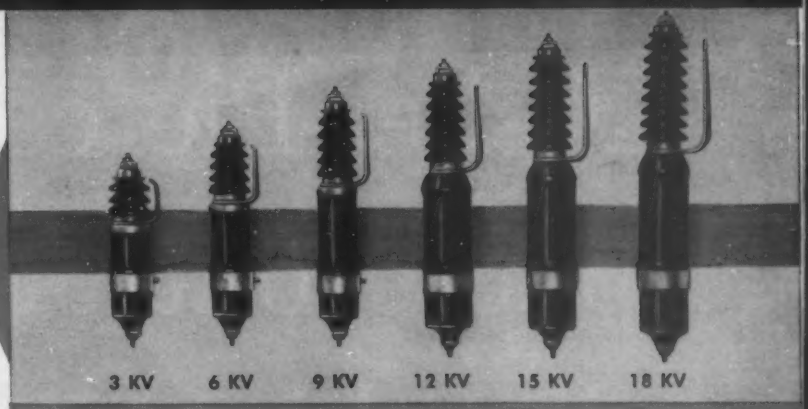
THE JOSLYN FAMILY

of distribution lightning arresters

gives you a choice

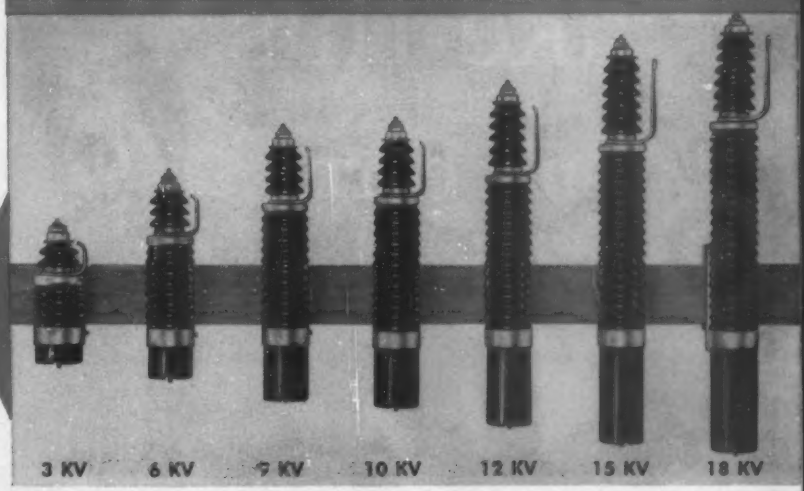
EXPULSION

The right arrester for the job where frequent and severe lightning occurs, but where system short-circuit currents are moderate. The ideal arrester for rural areas.

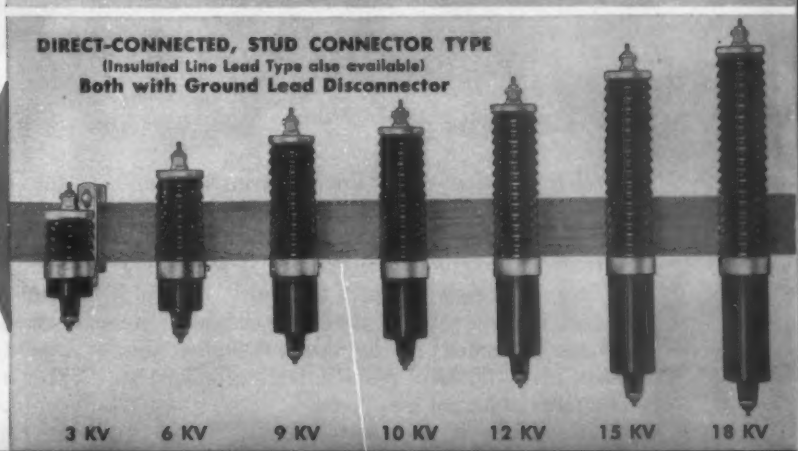


VALVE

The arrester to use where high system short-circuit currents exceed expulsion arrester capacity, but where less severe lightning currents occur. The ideal arrester for dense urban areas.



Choose the Right one for Your particular needs...



JOSLYN COMPLETE POLE LINE EQUIPMENT

JOSLYN MFG. AND SUPPLY CO.

155 North Wacker Drive • Chicago 6, Illinois

Why a "New" Fisher-Pierce photocontrol like this isn't born every day...

Model 6620

Call it "cautious New England conservatism" if you like, but offering a photoelectric street light control for widespread use by our utility customers throughout the country is something we do only when we're more than just "hopeful" that it will operate in the field the way the designer intended it to. Automatically, this means many hours of realistic testing under the conditions of actual use.

Fisher-Pierce now has an improved photocontrol to offer you and it's shown there in the photo captioned "Model 6620." It was developed for the same reason almost all new things are developed: to improve on what is presently available. From a sales standpoint it *is* new, but about five years of circuit design and component refinement lie behind it. We say it's an improved control because the circuit has fewer components *and dependably gives the same performance* as previous controls. (Cutting down the number of components *by itself* doesn't necessarily make anything "better" — only when it yields operation as reliable as you had in the first place.)

We think this new control is well worth trying.

NEW & SIMPLIFIED
MODEL 6620

Design approach: simplify the 6600A circuit without sacrificing performance or long life; use of new, fully tested Sigma AC relay permits elimination of certain components; 1000-watt capacity; guaranteed for two years.

THOROUGHLY
FIELD TESTED
MODEL 6600A

Fully proven with billions of service hours in field installations of all types; 1000-watt capacity; Model 6607 available for mounting bases 3⅛" in diameter; Model 6700 available for use on 240-volt lines, fits 3⅜" mounting bases; guaranteed for two years.

NEW,
500-WATT CAPACITY
MODEL 6650

Designed for farm lighting, other lower-wattage installations; similar to Model 6620 controls except for reduction of contact rating; ideal for use by utilities, REA's and cooperatives in promotion of farm and suburban lighting; guaranteed for two years.

other Fisher-Pierce controls and related equipment

TYPE 250A MULTIPLE RELAY for increasing by 3000 watts the load capacity of a single photoelectric control; compact, weatherproof, low cost.

SERIES 63300C CONTROL with 3000 or 6000 watts capacity; turn-on 0.5 to 500 foot-candles; weatherproof head enclosure fits meter socket.

SERIES 6100 CALIBRATOR for simple, rapid checking and adjustment of operating points of all F-P and nearly all other types of photoelectric controls.

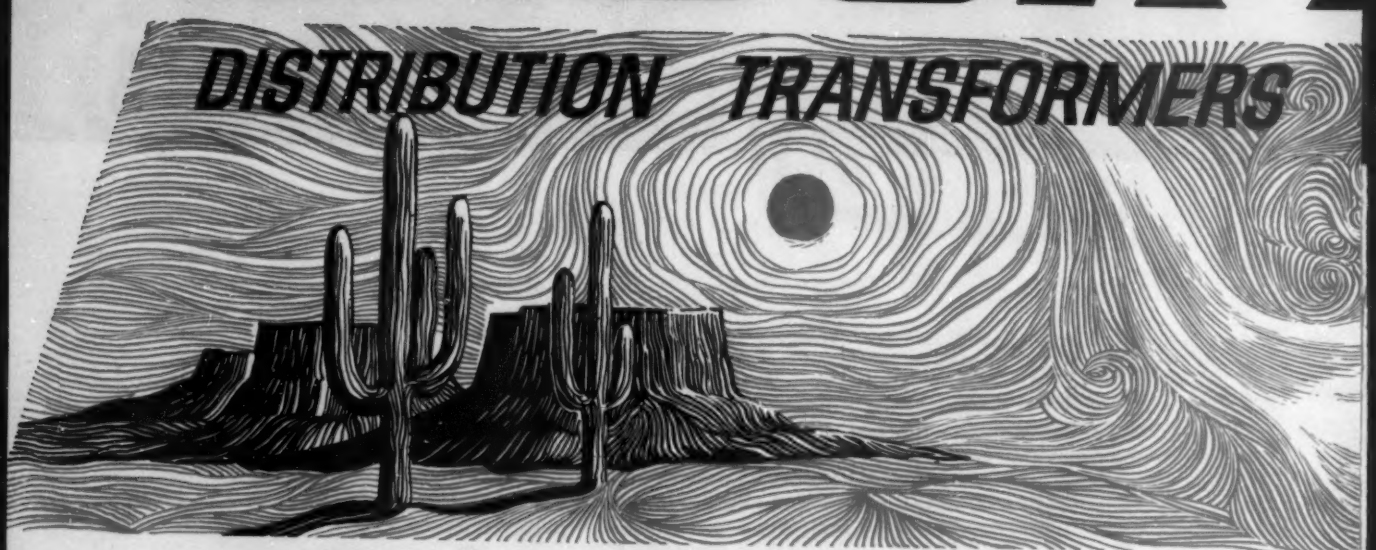
For complete design information and operating specifications on all Fisher-Pierce equipment, write Fisher-Pierce Division, Sigma Instruments, Inc., 59 Pearl Street, So. Braintree 85, Mass.

FISHER PIERCE

ALL-NEW

ENDUR

DISTRIBUTION TRANSFORMERS



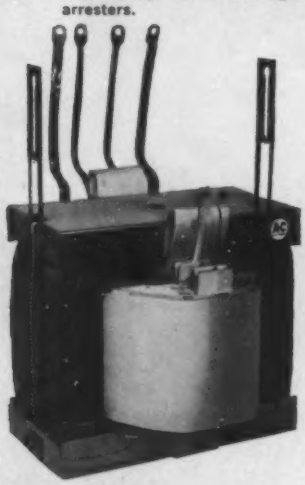
ALLIS-CHALMERS

A-1460

New enduring values... more for your transformer dollar...yours with the all-new ENDUR-ALL line... guaranteed to perform far better than any previous design!

ENDUR-ALL transformers are available in conventional and self-protected types with such accessories as a low-voltage circuit breaker, high-voltage fuses and lightning arresters.

ALL



New locked core-and-coil construction eliminates 32 nuts, bolts and washers from this assembly. Nothing to loosen, no welds to break. Locking straps assure uniform high compression for greater short-circuit strength.

ENDURING VALUES IN OVERLOAD CAPABILITIES

new high-temperature oil . . . new high-temperature insulation . . . greater oil duct area in the coil.

ENDURING VALUES IN INCREASED REVENUE

new design reduces impedance by as much as 25% — permits full utilization of the greater overload capacity.

ENDURING VALUES IN SHORT-CIRCUIT STRENGTH

new *locked* core-and-coil construction assures uniform high pressure clamping of the coil for the life of the unit.

ENDURING VALUES IN EASIER HANDLING

new ENDUR-ALL line is *10% lighter, 10% lower* for easier hanging.

ENDURING VALUES IN REDUCED MAINTENANCE

new high-gloss-retention paint . . . nonaging, reusable gasketing... plus elimination of all nuts and bolts from end frame construction. No welds to break — nothing to loosen or shake free.

. . . AND ALL THESE ENDUR-ALL DESIGN ADVANTAGES:

- 65 C rise with high overload capabilities
- Reduced maintenance with internally clamped bushings
- *Tuffilm* plastic-coated cover protects from animal and bird outages
- Series-multiple switch lowers changeover cost when making distribution voltage conversion. Write, phone or wire your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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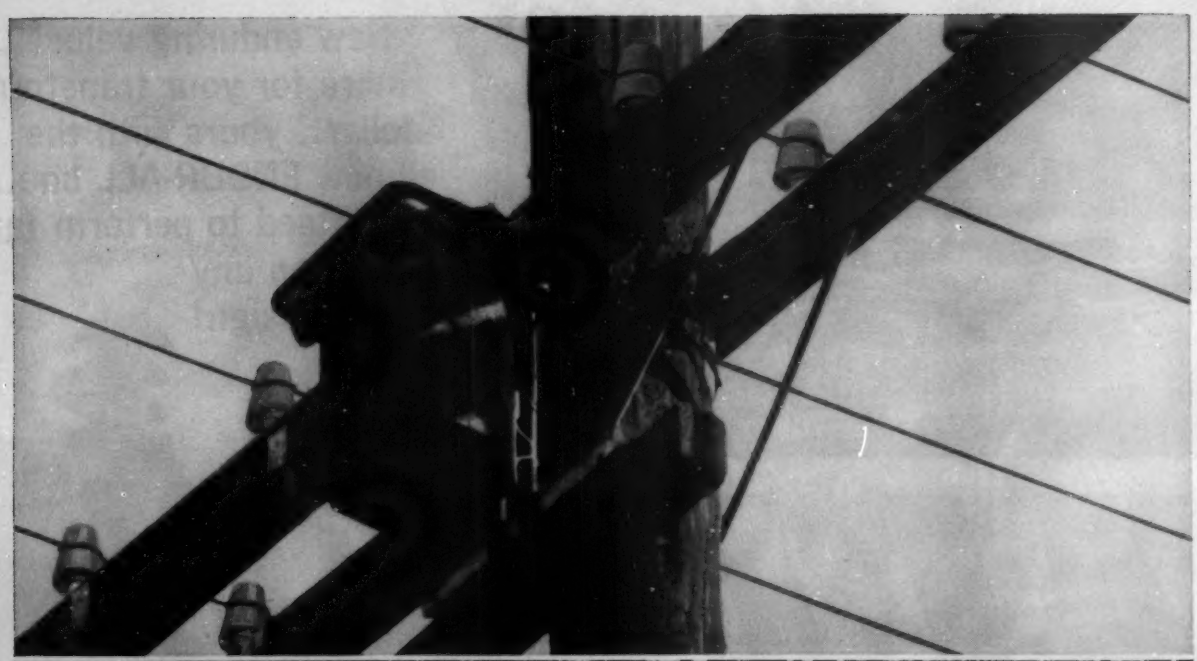

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No poles or overhead wires will mar the beauty of Arvida's Royal Palm Yacht & Country Club residential community! With 742 homesites, this distinguished Boca Raton, Florida community is putting *all utilities underground*. For the job Arvida selected Orangeburg Fibre Conduit—the best known, best-selling Brand in America. And for good reasons: Orangeburg Conduit is lightweight, easy to install. Its self-sealing joints and impermeable walls keep water out for good. Its 100% smooth fibre raceway adds years to cable life. Get all the facts on Orangeburg Fibre Conduit. Write Dept. ES-41 for Catalog 52.

Architect's drawing—Arvida home of Dr. and Mrs. John F. Pearl. Architect: Arthur H. Rude, of Ft. Lauderdale.

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Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Company with branches and stocks in principal cities.
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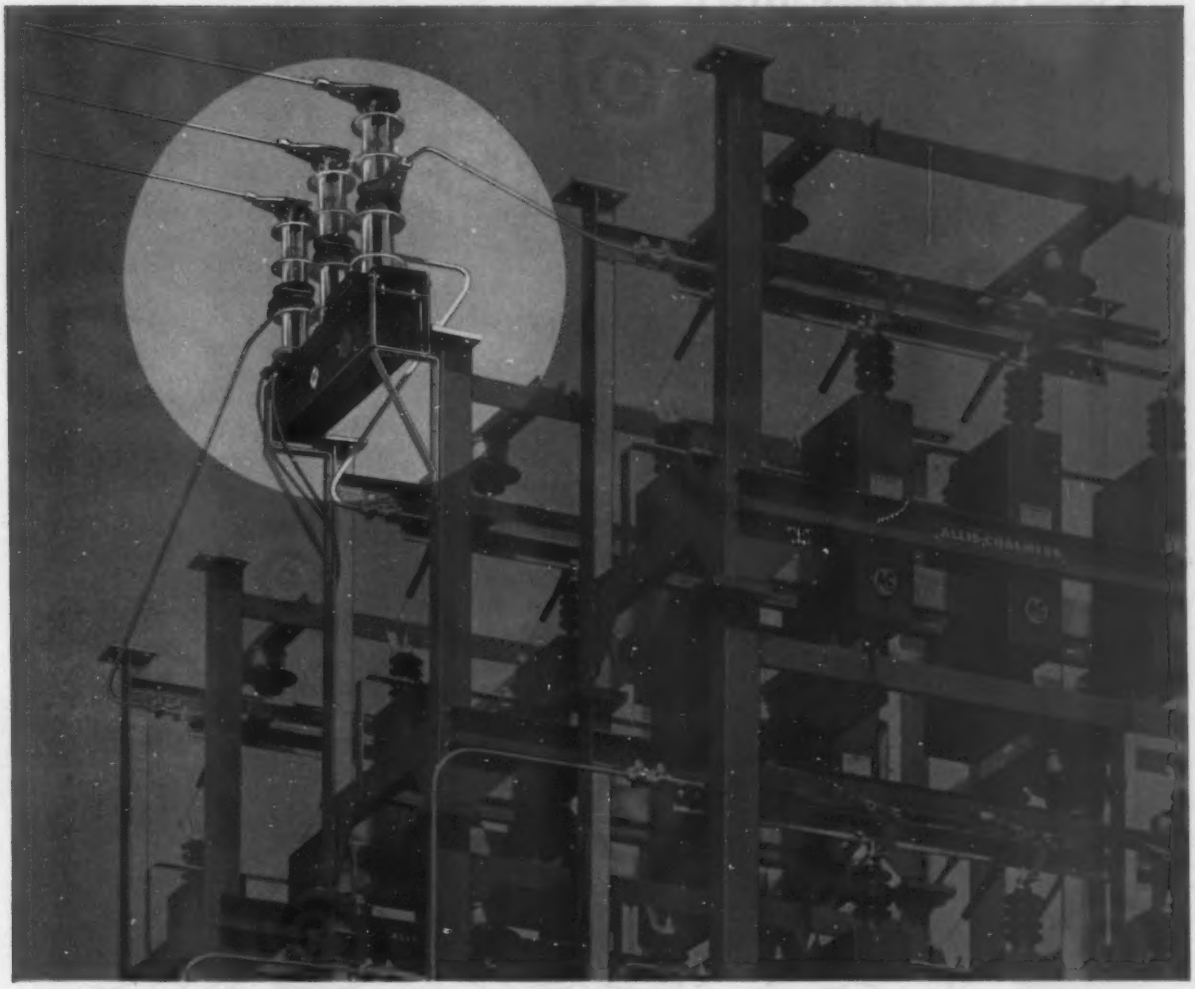


Now...a low-cost vacuum capacitor switch

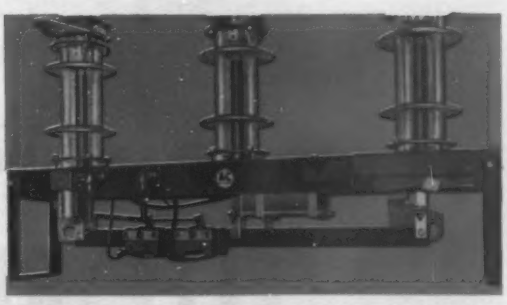
Restrike-free... lightweight... reliable

Competitive with conventional oil switches... this new 14.4-kv, 300-amp Allis-Chalmers three-phase vacuum switch is specifically engineered for capacitor duty. It operates from ac or dc, manually or by fully automatic control as the system demands. You get restrike-free performance, reliability and maintenance-free operation. Weight is one-third that of oil-type switches.

Resistance to physical damage is just as spectacular. Point-blank, 22-long rifle fire failed to penetrate the tough Plexiglas protective housing. The vacuum tubes withstood pressure tests in excess of 20 times normal closing forces.

For more information, contact your nearby A-C office. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

A-1409



How it works — Front view shows capacitor switch mechanism housing with cover removed. When coil is energized, solenoid plunger moves connecting rod through cam to close the contacts.

For more details on above items, use reply card on page 27

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"Twenty years ago I had the best intentions and the worst performance on thrift you ever saw. I was always starting regular savings, *next payday*. Then I signed up for our company plan for buying U. S. Savings Bonds on systematic deductions and things really began to happen. For a man like me the savings allocation has to be taken out first, and our Plan does just that. Like so many of our people around here, I've stayed right with the Plan since the day we set it up."

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ORIGINATORS OF 5/8% STEP REGULATORS

Insist on complete UNIT CONSTRUCTION to speed untanking...

bring maintenance out into the open

Unit construction of the JFR regulator simplifies untanking — brings all components and connections into full view! You make *all* internal inspections without breaking any electrical or mechanical connection. And you can *operate* the regulator for testing while the unit is untanked.

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Should you need a regulator replacement part — A-C maintains nationwide stocks. *Specify* **Allis-Chalmers** *Regulators . . . call, write or wire your nearby A-C office.*

Exclusive CALIBAND control cuts control-setting time without changing customer voltage or line-drop compensator settings.

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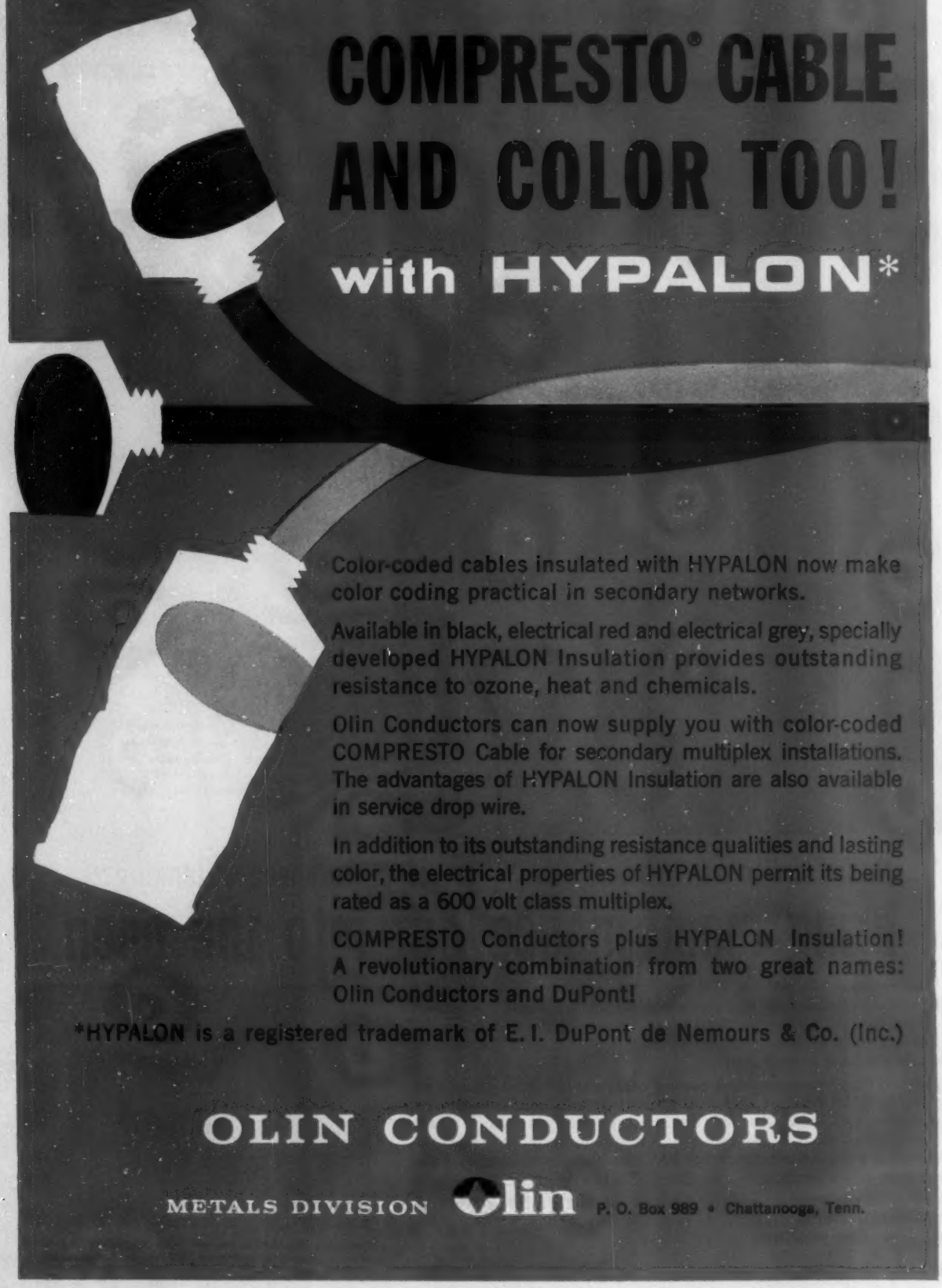

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Olin Conductors can now supply you with color-coded COMPRESTO Cable for secondary multiplex installations. The advantages of HYPALON Insulation are also available in service drop wire.

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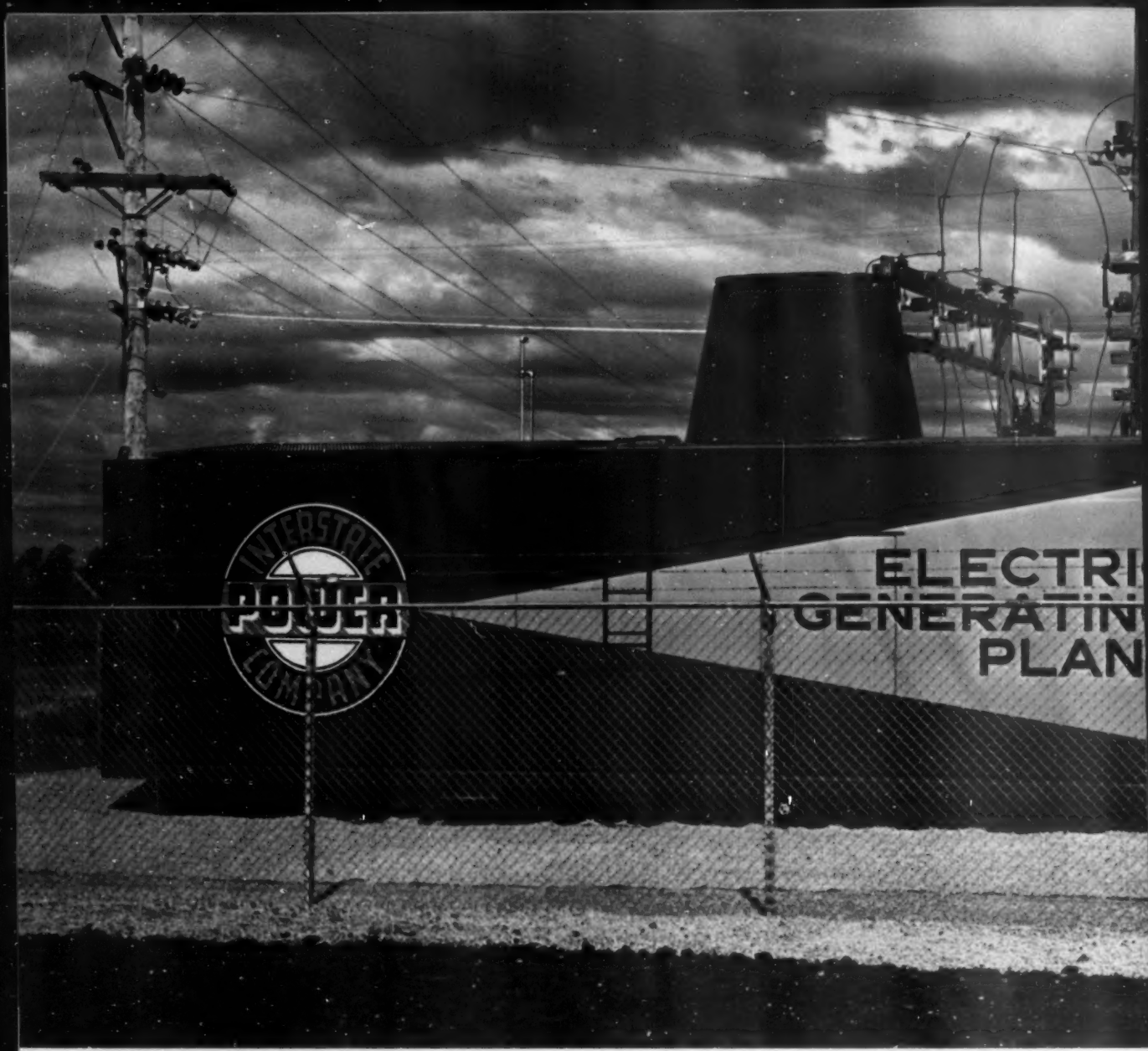


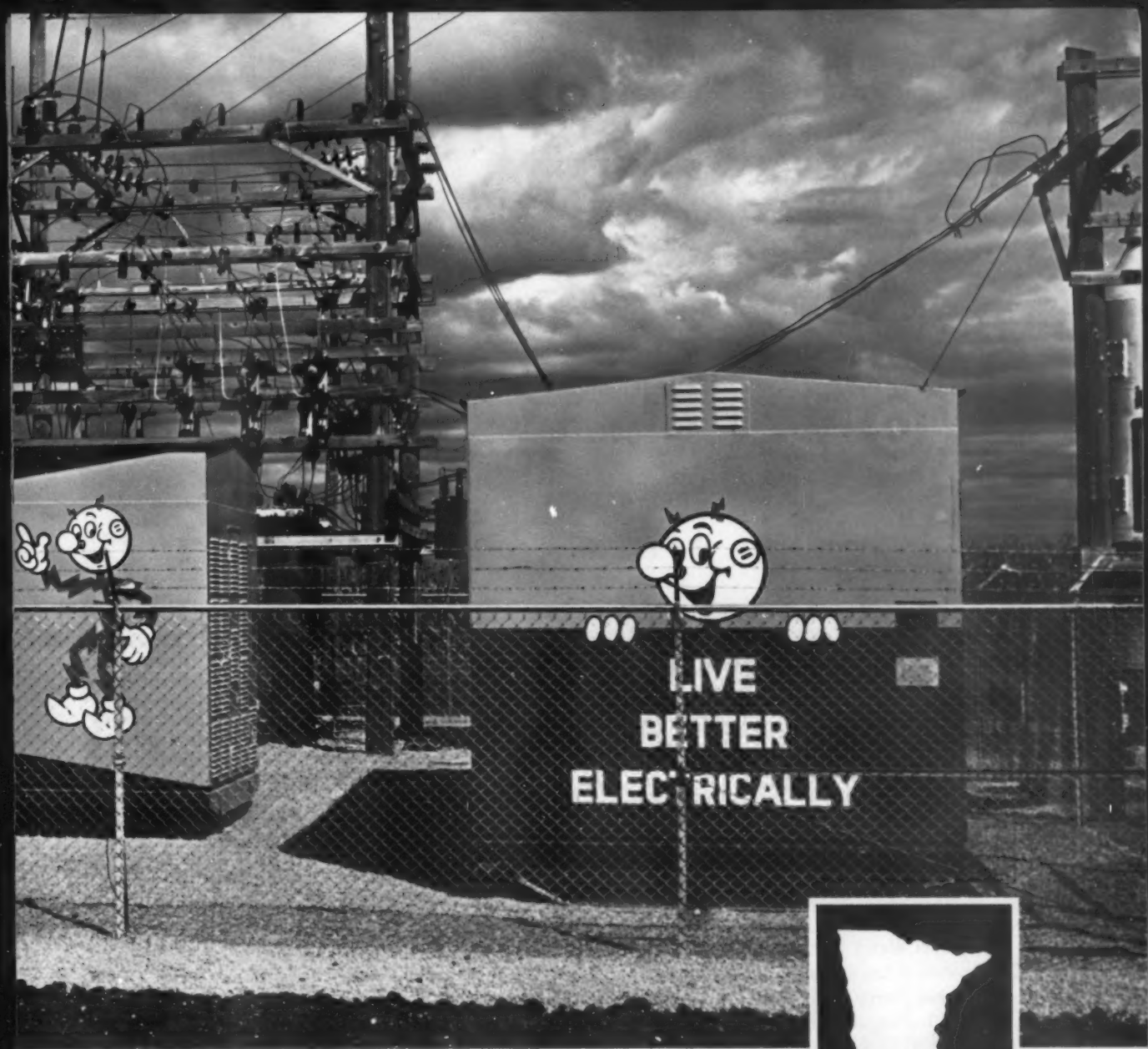
Interstate Power Insures Service with

Interstate Power Company has installed a 2000 KW Electro-Motive Diesel Plant at Hills, Minnesota, to provide peaking power and area protection to Hills and five other communities in the western end of the system.

The installation of Diesel Peaking Power made it possible for Interstate Power to economize because it eliminated the need for a more costly second transmission line. And the automatic deadload pick-up feature of the Electro-Motive equipment also makes it possible to protect the area against emergency line outages. Designed for automatic control, the new 2000 KW Plant synchronizes and goes on the line in less than two minutes. On several occasions since its installation, when transmission line trouble occurred, the Electro-Motive Plant automatically picked up the area load and maintained it until the system returned to normal.

FLEXIBLE AND RELIABLE—The inherent design characteristics of the Electro-Motive Equipment at Hills, Minnesota, that make it ideal for peaking and area protection, also make these Plants ideal for many of your system requirements:

- fast start for spinning reserve
- automatic deadload pick-up for area protection



Electro-Motive Peaking Plant

- unattended operation for remote control peaking service
- portability for simple installation
- freedom from damage to components caused by rapid thermal changes occurring from start to full load

Available in units from 2000 KW to 10,000 KW, the Electro-Motive peaking equipment line contains both Diesel and dual-fuel plants that can permit matching the plant to exact requirements for the most economical and efficient operation at the lowest investment. Ask your Electro-Motive representative for complete details.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

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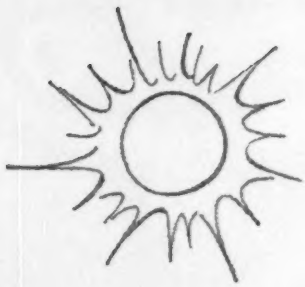

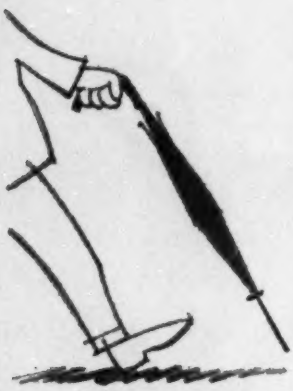

In Boston

even the photocontrol companies are conservative

Not conservatively *old-fashioned* — just conservatively *careful* about shouting the virtues of something new, before it has had a chance to prove itself.

Fisher-Pierce is a photocontrol company in Boston,* and has something new: a simplified control with fewer parts and consequently a lower price, and another new control ideal for lower (500) watt applications such as farm buildings, gas stations and the like.

Both look good and both are well worth trying on your job. Neither, however, has the indisputable proof of field experience the "good old" 6600A has . . . *yet.* Fisher-Pierce Division, Sigma Instruments, Inc., 59 Pearl St., So. Braintree 85, Mass.

*Well, 15 miles due south of Beacon Hill

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The editors of Electrical South will welcome contributions from the field for publication. Electrical contractors, consulting electrical engineers, light and power company engineers, and others closely associated with the electrical industry are invited to submit articles, photographs, and drawings relating to important and interesting electrical projects in the South and Southwest.

Articles are wanted in two principal classifications:

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***Utility Engineering:* Articles relating to any phase of transmission, distribution, and metering, including design, installation, testing, and maintenance. These articles should be "by-line" articles carrying the name of a Southern or Southwestern light and power company.**

All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

Address all communications to the editor:

Electrical South
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1

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Contractors with an eye on cutting connector installation time count on the Burndy Big 3. This Y10M, MY29-3, Y34A combination crimps practically every type and size compression connector on any job...adds the versatility, speed, and economy that result in profitable jobs. See your local Burndy distributor for demonstration.

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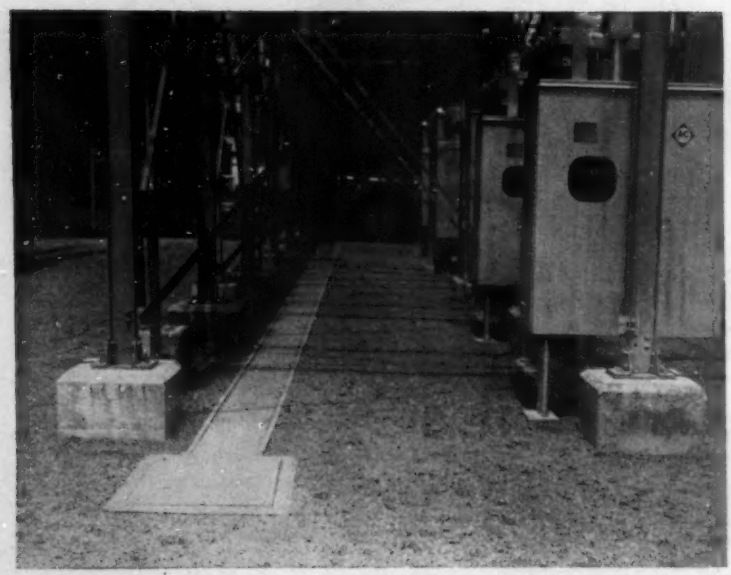
Substation control cable troughs



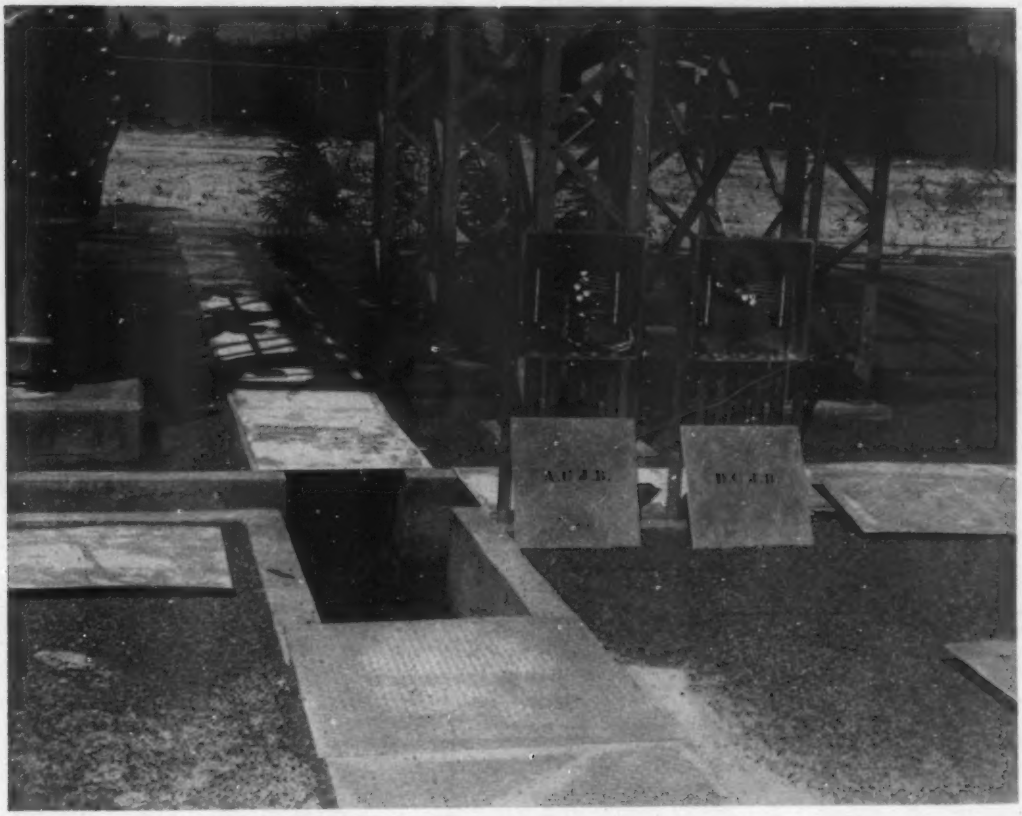
By Marvin Bostian, Substation Engineer, Tampa Electric Co., Tampa, Fla.

◆ To keep pace with the tremendous load growth in Tampa Electric's service area, we have had to increase both the number of substations and the size of existing ones.

We have had to design and construct substations with the knowledge that in a few years transformer capacity would have to be increased and new circuits added.

It has been necessary to make changes in relaying schemes as stations became closer together, and to install differential and backup relaying as stations became bigger and more important. In other words, changes and additions to the control cable system are made every few years.

Until five or six years ago, all



Tremendous load growth has required an increase in the number of substations and the size of existing ones in the service area of Tampa Electric Co., Tampa, Fla., necessitating frequent changes in control cable arrangements. Recently, the company has found that such changes are more economically made when a complete cable trough is provided, such as shown in these three views of typical installations.

control cable on the Tampa Electric system was installed in an elaborate system of duct lines. These duct lines consisted of suitable main lines containing a number of two- or four-inch ducts connecting the control building to manholes in the switchyard. Individual conduits were run from the manholes to the various pieces of equipment.

In different localities we use almost every type of duct material available. These include orangeburg, transite, and galvanized conduits, both encased in concrete and directly buried; fiber conduit encased in concrete; and PVC conduit directly buried. All control cables entered the control house through these duct systems and into a cable pit or trough below the switchboard panels.

This necessitated a great deal of form work in connection with substation floors and required that a great deal of conduit be placed in the floor, keeping the cost of control buildings rather high.

While this type system made it fairly easy to install additional cables, it became extremely difficult, if not impossible, to plan duct lines that would not become outgrown in a few years. If it were possible to plan such a system, the cost of installing it would be prohibitive.

The problem of getting all of the duct, present and future, into the control house also posed a problem. Cost figures showed that the money spent in the floor and cable pits in the control building was out of proportion to that spent in all the rest of the structure.

A great deal of thought was given to a more economical method of installing control cables, and problems were discussed with several cable manufacturers. A number of articles have been written about the damage to cables by rodents and termites, and we will not go into these in detail.

One accepted method of preventing this damage was by the use of a fairly heavy metal shield on the cable, preferably of steel. Copper was suitable if thick enough, while soft metals like lead were not too satisfactory. The damage from termites seems to be caused by the migration of termites from buried wood to the surface of the ground and back. This migration seems to be nearly vertical.

Some writers seem to think that

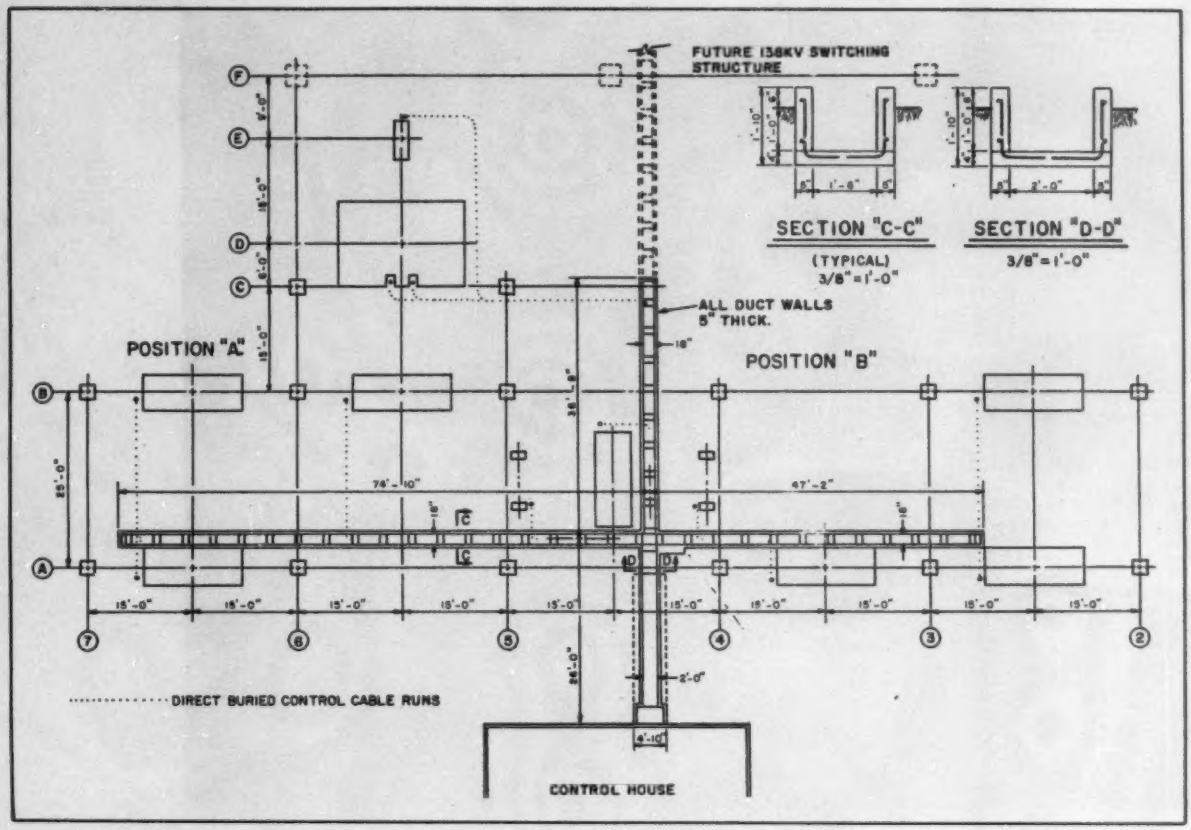


Fig. 1—Plan view of concrete cable trough layout for the Clearview Substation of the Tampa Electric Co.

if cable were buried three feet deep the termite problem could be ignored. There is no proof to bear this out, and we decided to use a depth of about two feet. It was believed that for our purpose in general substation use shielded cable would prove too expensive, so we resolved to use a standard cable with a polyvinyl chloride insulation and jacket.

Double problem

In 1956, when we were doing engineering for our Gannon Generating Plant and Sandhill Substation, the problem of control cable presented itself in two different forms. At Gannon it was necessary to build the 138-kv switching station about 4,800 feet from the generating plant.

While we would have supervisory control on all of the 138-kv breakers, we felt it desirable to also be able to control them from the plant. After much discussion, it was decided to dispense with duct lines for this 4,800-foot run. Aerial cable was discussed but eventually we installed two 50-conductor control cables, several four-conductor cables for relaying, and one three-conductor cable for station power.

All the control and CT cables were polyethylene insulated and had a nylon jacket on the individual wires. The cables had copper sheaths and PVC jackets. The power cable was similar except it had butyl insulation and no nylon jacket. These cables were buried approximately two feet deep and were covered with a treated two-inch board for mechanical protection only.

Splices were made in junction boxes located above ground while the cables were protected by steel conduit entering and leaving the junction boxes. These cables terminated in junction boxes at both ends and PVC insulated wire was used from the junction boxes to the various pieces of equipment.

This 4,800-foot cable run was through unfenced swampy land flooded at times with brackish water and parallel to our 138-kv right-of-way.

For the cables in the substation, overhead expanded metal cable trays were installed. Since Gannon has a ring bus, the placement of the breakers and outgoing feeders presented no obstruction to these cable trays along one side of the structure.

Thus all cables at the Gannon Substation, with the exception of the cables going back to the plant, were kept out of the ground.

Concrete trough

At Sandhill our first departure from all duct lines and completely encased control cables took the form of a concrete trough with solid sides and bottom running the length of the station. It was covered with a ½-inch checkered steel plate.

A duct line extended from this trough into the building and individual conduits connected it to the various pieces of equipment. In this installation, as in stations where we had all duct lines, we used a great deal of single conductor PVC insulated wire.

Such an installation was very satisfactory, with the exception of one minor problem. Sandhill Substation is located in the center of the phosphate fields, and the water lying in the cable trough was found to be reacting with the

pigments in some of the PVC insulation on the single wires.

Most of the colors were only slightly affected, but the blue turned green until it was impossible to distinguish between the blue and green wires. Of course, out of water the problem was not present.

Additions necessary

It has been necessary to go back several times to make additions to Sandhill Substation. The main duct run to the building and the cable trough still have room for additional cable. When these are added, it is necessary to break a hole in the side of the cable trough, run conduit from the trough to the new equipment, encase it in concrete, and then pull in the new cable.

Whereas the Sandhill installation was a departure and an improvement from the duct-line system, the conduit from the trough to the equipment was still expensive. The cost of the control house floors with their cable pits and conduit still needed to be reduced.

We then evolved the method we presently use—that of directly burying control cable. In general, we use three different approaches: one on small stations without a control house, one on small stations with a control house that will accommodate a maximum of six control switchboard panels, and one on larger stations with a control house that will accommodate a maximum of 22 control switchboard panels.

The first will only be touched upon, but the last two examples will be discussed more fully.

In all of our new stations, we endeavor to prepare the ground by removing all vegetation and are careful not to bury any pieces of wood that might invite termites. In stations involving fills, clean sand with no vegetation is used, and the land is cleared of debris before it is filled.

In small substations the control cable is directly buried to a depth of approximately two feet. Schedule 80 PVC conduit is used from the equipment and extends about six inches into the ground. No treatment of the cable trench or the backfill is made.

Drawings are made showing the location of the cable in the station, and construction crews place the cable as specified as nearly as possible.

In the small station with outdoor cabinets, the cabinets are placed on concrete piers six to eight inches high; and the cables enter between the piers and up through the bottom of the cabinet. In stations with small control houses, the cable runs underground directly to the control house, then up through an inside steel duct to a metal cable trough over the switchboard panels.

In our stations we do not install control cables and ground wires in the same ditch. Parallel runs are kept at least a foot apart. Where it is necessary to cross them, the ground wire is located about six inches below the control cable.

Bottomless trough

In the major substations we install a concrete cable trough 16 inches deep and either 18 or 24 inches wide, depending on the number of cables to be installed. This trough has no bottom but has ties installed on approximately four-foot centers to brace the two walls.

All cables enter and leave the cable trough under the side walls except when they enter the control house. The top of the trough is covered with a 12-gauge checkered plate with stiffeners welded to the bottom to stiffen the plate and to prevent it from sliding off the trough.

Some trouble was experienced in the first cover plates made as they warped when galvanized. The present design has eliminated this problem. The cover plates are kept short enough so that one man can easily remove them when necessary.

Figure 1 shows a concrete cable trough layout for our Clearview Substation. Previous to this type installation, we placed all junction and distribution boxes near manholes and installed a number of one- to 1½-inch conduits to the manhole.

This involved undesirable use of duct lines for a-c and d-c power to equipment and for getting station differential current leads to a common junction point. We are now installing distribution boxes above the wall of the cable trough with short runs of conduit from the boxes to the trough.

To continue the same line of thinking, we have designed control buildings that contain no conduit or cable pits in the floor. All cables enter the house under the foundation wall, run up through the floor and, by means of a metal trough run up over the switchboards and other equipment.

The battery charger with a-c and d-c fuse cabinets is mounted on a partition wall and cables go to the overhead metal trough through short pieces of conduit.

Since these changes took place over a number of years with labor and material costs changing, it is almost impossible to accurately determine the savings realized in direct burial of control cable. Some rough estimates have been made using present day prices and labor costs. These figures are included with this paper and will only be summarized here.

The costs of outdoor overhead metal cable trays have not been included because on two of our recent major stations such an installation was considered and discarded. No economical method of installing overhead cable trays was found that would permit easy access to all equipment.

We believe that only in special conditions, for example, a station like our Gannon Substation with its ring bus, should the overhead cable tray be considered.

Basis of comparison

In making our estimate we used our Clearview station as a basis of comparison. It was also assumed that we would need one 12-conductor, one seven-conductor, two four-conductor, and two two-conductor cables for each OCB. The cost of cable is not included.

The initial cost of a cable duct system would be $2,582, and it would cost $60 each to add OCB's A and B. The initial cost of a cable trough system would be $1,545, and it would cost $16 each to add OCB's A and B.

The initial cost of a direct burial cable system would be $105, and it would cost $127 to add OCB A and $52 to add OCB B. The costs of adding additional cables with the direct burial system are increased with the length of the cables, and a control ditch can only be opened and cables added a certain number of times until the cables are almost on top of the ground.

Kerosene spray

Recently, we have been using a kerosene spray on our substation yards to kill vegetation. In one or two of our older stations where we had rubber insulated cable, the kerosene caused the rubber to swell and we anticipate cable trouble in the future.

In stations with PVC insulated and jacketed cable, we see no ill

(Continued on page 125)

Transformer housings for UG service

Discussion period at manufacturer's seminar on distribution discloses interesting facts on this method of serving residential customers

◆ A seminar on distribution problems and equipment, conducted recently by Line Materials Industries, and attended by nearly a hundred electric utility company engineers, included a "brass tacks" conference at which Line Material personnel answered a wide range of questions presented by the utility company engineers.

Because the seminar had included a comprehensive discussion and demonstration of equipment available for serving residential customers from underground lines and services, the question and answer period developed some interesting information on this topic. A transcript of this portion of the conference follows:

Question: What is the largest bank to date of Transclosure housings and what was the application?

Answer: Three 333-kva, 7,200/12,470 wye-connected transformers were installed in a housing consisting of three units joined into one. No interior walls separate the three sections. This installation provides three-phase power and single-phase lighting for a new high school building.

Public Service Company of Arizona has a similar installation in Phoenix.

A seven-bank unit is now being installed in West Allis, Wis. One unit houses primary metering equipment and another houses incoming switching devices. The other five units contain constant-current regulators for street lighting and associated protective and switching equipment.

Standardization when?

Question: When will transformer housings be standardized by EEI and NEMA?

Answer: Transformer enclosures are not standardized, although the base dimensions of one competitive unit are 42 inches square, the same as our DU8E series Transclosure housings. The base dimensions of another competitive unit are 32 inches by 44 inches. All present transformer enclosures do have primary and secondary doors on opposite sides of the housing.

Question: What are safety code requirements for Pad-Mount and Transclosure housing installations?

Answer: Transclosure housings and Pad-Mounts are relatively new products and as such are not specifically covered in any safety codes. Probably the only applicable safety code would be the National Electrical Code, but even this covers electrical installations only, not specific products.

From the 1959 National Electrical Code the following portions are cited:

Paragraph 450-24(d) titled "Detached Buildings — Transformers may be installed in a building which does not conform with the provisions specified in this code for transformer vaults provided neither the building nor its contents present a fire hazard to any other building or property, and provided the building is used only in supplying service and the interior is accessible only to qualified persons."

Paragraph 710-31 titled "Enclosure for Electrical Installations — Electrical installations in a vault, room, closet, or in an area surrounded by a wall, screen, or fence, access to which is controlled by lock and key or other approved means, are considered accessible to qualified persons only. The type of enclosure used in a given case shall be designed and constructed according to the nature and degree of the hazard(s) associated with the installation."

Paragraph 450-25 titled "Oil Insulated Transformers Installed Outdoors — Combustible material, combustible buildings, and parts of buildings, fire escapes, door and window openings, shall be safeguarded from fires originating in oil-insulated transformers installed on, attached to, or adjacent to a building or combustible material.

"Space separations, fire-resistant barriers, and enclosures which confine the oil of a ruptured transformer tank are recognized safeguards. One or more of these safeguards shall be applied according to the degree of hazard involved in cases where the transformer installation presents a fire hazard.

"Oil enclosures may consist of fire-resistant dikes, curbed areas or basins, or trenches filled with coarse crushed stone. Oil enclosures shall be provided with trap drains in cases where the exposure and the quantity of oil involved are such that removal of oil is important."

We believe the Transclosure housings do not conflict with any applicable portions of the National Electrical Code. With proper concrete pad designs, Transclosure housings are suitable for application next to combustible buildings or materials.

Grounding: how elaborate?

Question: How elaborate should the grounding system around a Pad-Mount or Transclosure housing installation be? One ground rod or an inter-connected grid?

Answer: Most Transclosure housing installations have been grounded by providing one ground rod through the concrete pad at each Transclosure housing location. Under reasonably good grounding conditions, the single ground rod should be more than adequate. Where high-resistance grounds are encountered, the safest installation would be an inter-connected ground grid.

Question: What is the percentage of customers who prefer air switches as opposed to oil switches in surface mounted residential distribution transformer installations?

Answer: With Transclosure

housings only, by far the largest percentage of customers utilize air switches for cable sectionalizing. The Transclosure housing affords the required space for these air switches. Also air switches cost less than separately housed oil switches.

With Pad-Mount transformers the exact opposite is true. The self-contained oil switch in the Pad-Mount is less expensive than external air disconnects.

Why the preference?

Question: What reasons do they offer for their preference of switching methods? Safety of visible disconnection, similarity to overhead operation, operating procedure simplified, cable terminations permanently fixed, or other reasons?

Answer: All of the cited reasons have been brought forth at one time or another by our customers, but probably the most universal reason is that the air disconnect offers visible evidence of a break in the circuit. This break can be achieved very rapidly and does not disturb the cable termination in any way.

Question: Can an expulsion fuse be used successfully in a cabinet or Transclosure housing containing 15-kv cable indoor terminations and other insulated devices?

Answer: There *are* specific limitations to employing an expulsion type fuse in a Transclosure housing. With prudent location of the cable relative to the expulsion fuse, there is practically no contamination of the cable termination when the fuse is operating.

It certainly would be advisable to examine all cable terminations and other insulating surfaces after a fuse operation in a Transclosure housing, and to clean these areas if there is visible evidence of contamination present.

Question: What is the prevalent thinking on protected versus conventional transformers for Pad-Mount and Transclosure housing applications?

Answer: Most customers employing protected transformers on their overhead line will do the same on residential underground. There are inherent advantages to the protected-type transformer in either a Pad-Mount design or a Transclosure housing.

There is a definite need for a non-expulsion or very limited expulsion-type fuse for use in housings. When and if this fuse is developed, it may have a very decided effect on the use of protected versus conventional transformers.

Protected transformers have particular appeal in the Pad-Mount design because it enables the manufacturer to keep the over- all size of the Pad-Mount transformer to an absolute minimum.

Providing external fusing requires more space than normally available in standard size Pad-Mount transformers. The space is generally available for external fusing in Transclosure housings.

Question: When and where should lightning arresters be installed on residential underground systems?

Answer: As a general rule lightning arresters should be installed at all cable riser points, plus at all transformer installations where the cable is either terminated or normally open.

Question: Might pothead terminations of 15-kv cable in Pad-Mounts and Transclosure housings be economically feasible in the light of contamination hazards and the attendant possibility of high maintenance costs?

Answer: The final answer to this question can be obtained only by observing actual operating performance of indoor-type stress cone terminations. To date, a large number of Transclosure housings and Pad-Mounts are operating with simple indoor-type stress cones rather than the more expensive pothead-type termination.

To my knowledge, we have received no reports of failures due to cable termination breakdown inside either Pad-Mounts or Transclosure housings.

Admittedly, our operating time and experience in this area are rather limited. The decision to use potheads or indoor stress cone terminations certainly should be influenced by the prevailing environmental conditions in the area where the Transclosure housing is to be installed.

Pothead terminations certainly should be given full consideration when Transclosure housings are installed in heavy industrial areas or along seacoast areas where the probability of high contamination exists.

What about rust?

Question: Is there a rust problem with steel cabinets and Transclosure housings?

Answer: There is always the possibility of rust problems when steel cabinets, including Transclosure housings, are employed outdoors, exposed to the elements. We have taken great pains to establish a painting system for Transclosure housings that will assure a long maintenance-free life for the equipment.

The painting system begins with a proper cleaning of the steel, progressing to the zinc-phosphate coating of the steel and then to the prime coat and finally the finish coat of baked enamel.

The finished product should achieve our goals of low maintenance plus long life in most areas of application. We will have available very shortly a full line of painted aluminum Transclosure housings that may be utilized where corrosion conditions are extremely severe or where the absolute minimum in maintenance is desired.

A temporary expedient?

Question: Is the Transclosure housing merely a temporary expedient or is it a generally desirable concept for most future residential underground systems? Doesn't the Transclosure housing tend to lose the esthetic advantage of the low profile presented by the Pad-Mount design?

Answer: The Transclosure housing is definitely not a temporary expedient. Because of the economics offered, we do feel that the largest area of application for Transclosure housings is in industrial, commercial, and other specialized applications. The application of Transclosure housings in residential underground systems is and will remain a significant factor, especially with utilities entering the residential underground distribution on a rather limited scale.

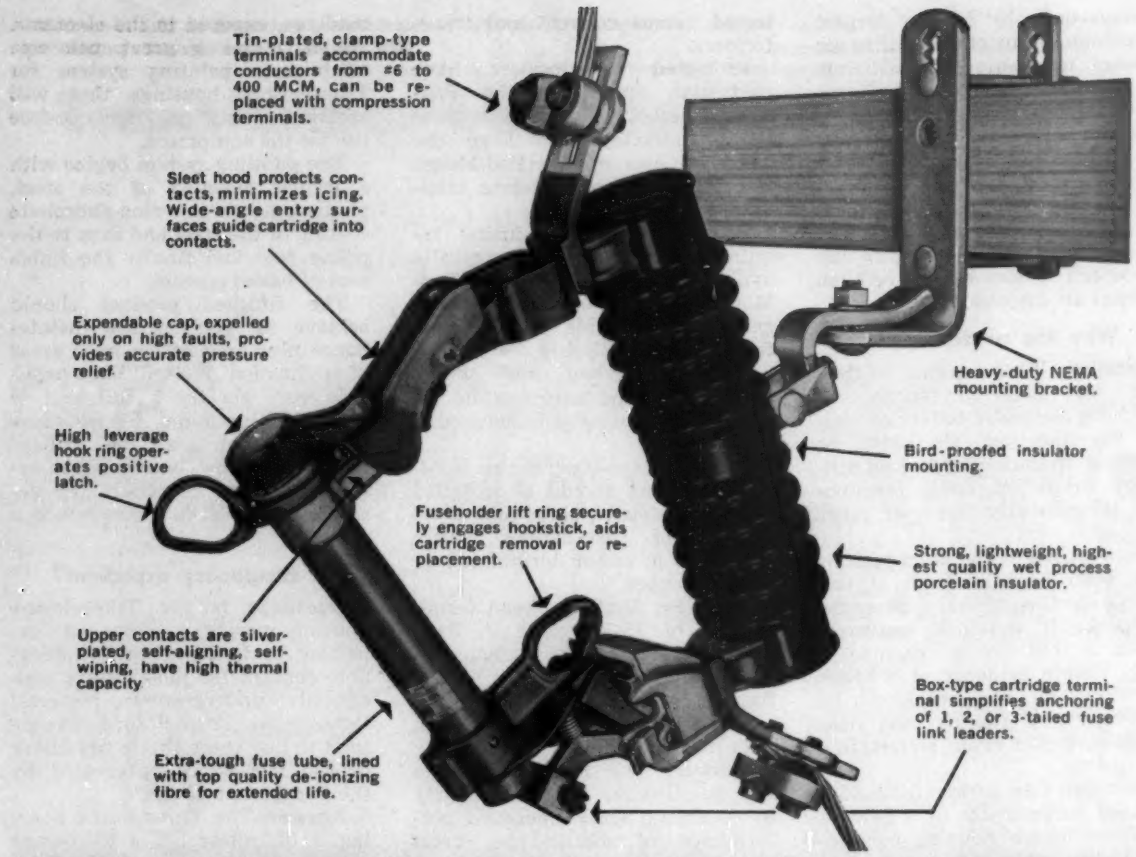
The Transclosure housing will never be able to compete with the low profile presented by the Pad-Mount design, but it does have the distinct advantage of being extremely flexible to meet the specific needs of customers without specialized designs.

Question: How much derating, if any, should be made on a transformer operated in a Transclosure housing?

Answer: Line Material transformers can be operated continuously at nameplate rating inside a Transclosure housing without suffering any significant loss of life due to overheating. The transformer does, however, run warmer than it would run if it were out in the open.

Under steady, long-term load,

(Continued on page 125)


Tin-plated, clamp-type terminals accommodate conductors from #6 to 400 MCM, can be replaced with compression terminals.
Sleet hood protects contacts, minimizes icing. Wide-angle entry surfaces guide cartridge into contacts.
Expendable cap, expelled only on high faults, provides accurate pressure relief.
High leverage hook ring operates positive latch.
Upper contacts are silver-plated, self-aligning, self-wiping, have high thermal capacity
Extra-tough fuse tube, lined with top quality de-ionizing fibre for extended life.
Fuseholder lift ring securely engages hookstick, aids cartridge removal or replacement.
Heavy-duty NEMA mounting bracket.
Bird-proofed insulator mounting.
Strong, lightweight, highest quality wet process porcelain insulator.
Box-type cartridge terminal simplifies anchoring of 1, 2, or 3-tailed fuse link leaders.

NEW KEARNEY 200 AMP "HX" CUTOUT

Kearney substation-proved to positively and repeatedly interrupt 12,000 amperes at 7.8 KV . . . 10,000 amperes at 15 KV

- No "blind" spots . . . a highly efficient combination of single end venting and expendable cap double venting insures dependable interruption throughout the entire fault range . . . from low current values to maximum rated capacity of the cutout.
- On low and medium faults, expendable cap remains intact . . . tube vents only at bottom. Controlled spring loading and long travel of lower hinge toggle whips fuse cable out of cartridge to insure positive low current interruption.
- Expendable cap is expelled only on high faults. Resultant double end expulsion in line with fuse tube relieves gas pressure, equalizes interruption shock forces and prevents damage to cutout or bracket.
- Switchstick-operated positive latch prevents accidental cartridge dropout due to vibration, impact, or magnetic forces.
- Strong, durable, non-ferrous construction for long life, optimum performance. All current-carrying parts copper alloy. Silver-plated contacts. Stainless steel pins and springs.
- Fuseholders accept all conventional button-type links.
- Kearney "HX" Fuse Cutouts are available on single insulator, NEMA station-post, or centerbolt insulator mountings; also in 100 ampere continuous ratings.

Ask your Kearney Sales Representative for full information or write for "HX" Cutout Bulletin

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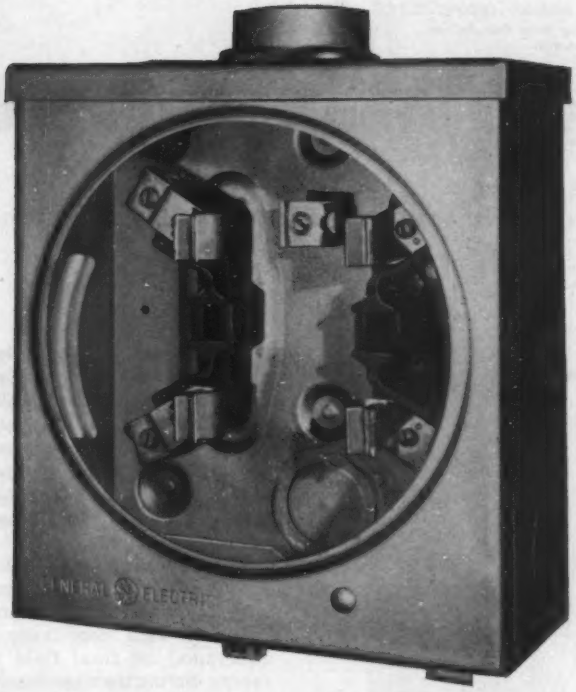

NEW Low-Price SI-60 Ringless Sockets

General Electric announces . . . another new line of sockets, the SI-60 for 100- and 200-amp services. Meets requirements of AEIC-EEI-NEMA standards for meter sockets. *Ringless Weatherproof Construction* provides maximum protection. And, G.E.'s new SI-60 line offers exclusive features never before available in a ringless design. *New Terminal Block Assembly* with exclusive one-piece combination jaw and connector strap increases reliability . . . permits an unbroken current path from meter blades to line or load wires . . . provides excellent electrical conductivity with low heat rise. *New Plug-in 5th or 6th Terminal* simplifies shop or field conversion . . . installs in seconds, without the use of tools.

New General Electric Line of SI-60 Sockets also feature 16-gauge zinc-coated steel*. *Die-cast Hubs,* of corrosion-resistant aluminum . . . available in all popular hub sizes up to 2½-inches. *Lay-in Wire Connectors* accommodate either aluminum or copper wire. *Concentric Knockouts* are on both sides, back and bottom; for 1, 1¼, 1½-inch conduit. Your choice of *Large Case Size*—3 sizes in 100-amp, 2 sizes in 200-amp—permits fast, easy wiring.

NOW AVAILABLE in 100- and 200-amp ratings. Available soon with manual by-pass. Contact your G-E Sales Office or authorized G-E distributor for full information. Or write General Electric Co., Somersworth, N. H.

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711-02

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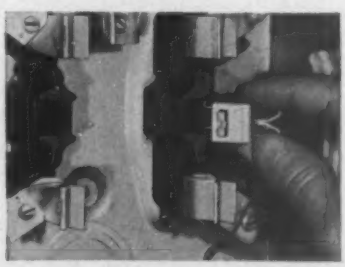
WEATHERPROOF RINGLESS CONSTRUCTION meets AEIC-EEI-NEMA standards. Case is 16-gauge zinc-coated steel with oven-baked finish. Hubs are die-cast of aluminum; staked to case for rigid, weatherproof fit.

EXCLUSIVE ONE-PIECE combination jaw and connector strap—in new terminal block—permits an unbroken current path from meter blades to line or load wires . . . provides greater reliability.



NEW PLUG-IN 5TH OR 6TH TERMINAL, another General Electric exclusive in ringless sockets, installs in seconds—without tools—greatly simplifies shop or field conversion.

For more details on above items, use reply card on page 27

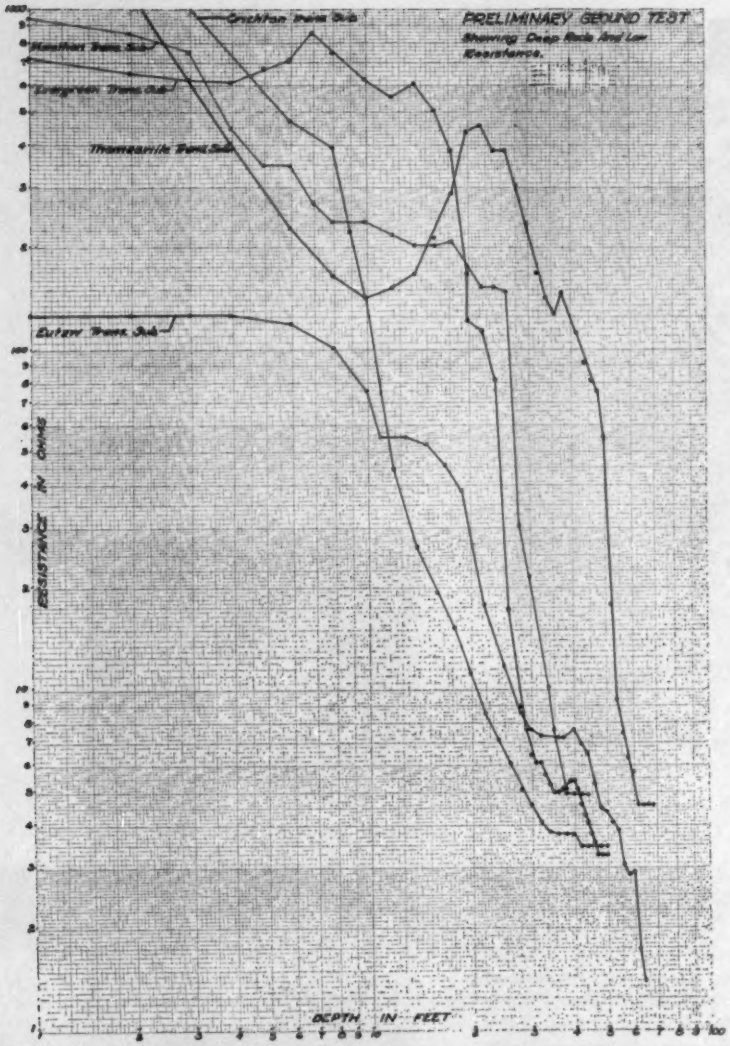


Fig. 1—The curves show the results of tests which were made at stations where low resistivity strata were reached by the driven rods.

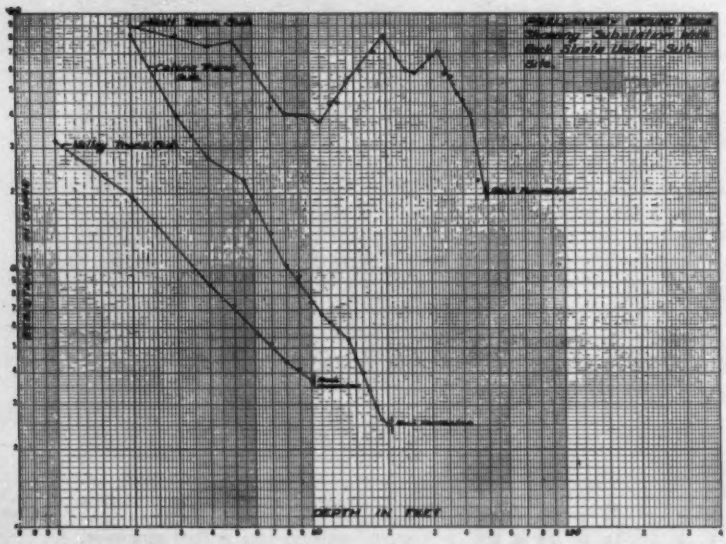


Fig. 2—Problem at three stations where rock stopped further driving.

Substation

This begins

By Thomas Chavers, Design Engineer, and S. R. Hart, Senior Design Engineer, Alabama Power Co.

◆ Low over-all substation ground resistance receives top priority consideration in the design of all transmission substations on the Alabama Power Company system.

This begins with accurate preliminary tests at the substation site followed by a detailed design based on data from these tests and concluded by final field measurements to verify the design.

The scope here is to briefly describe the testing, the make-up of the over-all ground field, and to present data on experiences with deep driven copper-coated steel rods.

Since surface strata in most areas of the Alabama Power Company system are of relatively high resistivity, the established practice is to depend on driven rods to furnish the required contact for low resistance ground fields. This makes preliminary tests a necessity if optimum design of number, depth, and spacing of rods is to be considered.

Tests are conducted in the very early stages of construction by highly qualified personnel. Usually this is a joint effort by the engineering department, responsible for the design of the substation, and the production department, responsible for the relay operation of the station and any matters relating to inductive coordination with other utilities.

The purpose of these tests is to investigate the soil resistivity in the station area and to determine depths of various low resistance strata.

Generally, for an average size yard approximately 150 by 200 feet, a minimum of two rods will be driven for preliminary test data with resistance readings taken every two feet of the initial rod and at large intervals on subsequent rods.

They are separated as far as

ground resistance gets top priority

with accurate preliminary tests at substation followed by detailed design

practical to determine non-uniform conditions. The rods are driven to increasing depth until resistance readings indicate no further decrease with additional depth or until dense strata makes additional depth impractical.

Figure 1 shows the results of tests at stations where low resistivity strata were reached.

Figure 2 shows the problems encountered at three stations where rock stopped further driving.

Testing equipment

The testing equipment used is a Biddle ground resistance "Megger" and the Vibroground model 259. Connections are the conventional three-point method. Both instruments are used to cross check readings.

Reference pins are located in opposite directions at distances of approximately 1,000 feet from the test point.

A typical test data sheet is shown in Figure 3.

Utilizing the data obtained from the preliminary test, a complete grounding system is designed which will give an over-all resistance as low as is economically feasible. The number, depth, and spacing of rods are determined on the basis of paralleling effectiveness as explained in an earlier paper[1] and in accordance with additional paralleling effectiveness data presented in this paper.

The rods are interconnected with copper cables that are buried approximately six inches deep. All structures and equipment are grounded to these cables and to a counterpoise grid of No. 4 solid copper wire.

Installation is in accordance with standard grounding notes which are given in Figure 4. Overhead ground or shield wires for all transmission lines terminating in the station are also connected to the station ground bus.

[1]Potential Gradients within and around Substation Ground Fields, C. C. Jones and C. R. Jager. Southeastern Electric Exchange, March 24-26, 1949.

PRELIMINARY GROUND TEST AT CRICHTON TRANSMISSION SUBSTATION

August 23, 1960 — Soil Conditions - Red Clay - Wet

This report covers the preliminary ground tests made at the Crichton Transmission Substation. Three (3) rods were driven: Two (2) to 50 feet and One (1) to 40 feet. Reference Rods: P_2 = 138 ohms, C_2 = 570 ohms, C_1P_1 Lead = .08 ohms.

		TEST ROD #1			
Depth-Feet	Megger-Ohms	Scale	K	Corrected Ohms	Vibroground
2	1650	3000	.992	1635	
4	870	3000	.992	862	840.0
6	630	3000	.992	624	
8	410	3000	.992	406	
10	70	300	.995	69.6	68.0
12	34	300	.995	33.8	
14	19.5	30	1.005	19.6	
16	13.5	30	1.005	13.6	12.0
18	11.3	30	1.005	11.3	
20	9.7	30	1.005	9.67	10.0
22	7.5	30	1.005	7.46	
24	6.1	30	1.005	6.06	
26	5.8	30	1.005	5.86	6.1
28	4.9	30	1.005	4.85	
30	4.2	30	1.005	4.14	5.0
32	4.5	30	1.005	4.44	
34	4.4	30	1.005	4.35	
36	4.2	30	1.005	4.14	4.3
38	4.1	30	1.005	4.04	
40	4.0	30	1.005	3.94	4.3
42	4.0	30	1.005	3.94	
44	4.0	30	1.005	3.94	
46	4.0	30	1.005	3.94	4.1
48	4.0	30	1.005	3.94	
50	4.0	30	1.005	3.94	4.1

As the resistance did not decrease at all between forty and fifty feet, there was no need to drive rod deeper.

Fig. 3—Illustrated here is a typical ground test data sheet.

TYPICAL SUBSTATION GROUNDING NOTES

1. All Risers Not Otherwise Indicated Shall Be #2/0 Stranded Copper Cable.
2. Install A Counterpoise Network Of #4 Bare Solid Copper Wire To Cover Areas Inside Of Dashed Lines, To Be Spaced 24" Center To Center And Every Third Point Of Intersection Connected By Sil-Fos Brazing. Counterpoise Network To Be Connected To 250 MCM Main Ground Bus On 10'-0" Centers By Sil-Fos Brazing. Counterpoise To Be On Top Of Graded Earth And Below Slag Surface. All Counterpoise Wire To Be Cut Every 25'-0" And With Breaks Staggered. All Ends To Be Driven Into Ground At Least 1'-0". Counterpoise To Extend At Least 10'-0" Beyond Equipment Inside Of Dashed Lines Where Possible. Counterpoise Anchors To Be Driven As Per Detail.
3. All Ground Bus To Be A Minimum Of Six Inches (6") Below Grade.
4. Use _____ Cartridges As Indicated, Make No Soldered Connections.
5. Leave Ample Cable Above Ground To Ground Steel Structures And Equipment.
6. Clean All Surfaces Thoroughly Before Making Connections.
7. All Buried Ground Clamps, Connectors, And All Switch Shunt Connectors Must Be Equipped With Everdur Bolts.
8. Extend The #2/0 Copper Cable Up Inside Of Steel Structure Leg And Connect To Equipment Or Overhead Ground Wire Where Indicated On Grounding Layout.

Fig. 4—Installation was in accordance with typical grounding notes.

PERFORMANCE OF DEEP RODS

BARRY SUBSTATION - AFTER 80 MONTHS

Depth	Initial Resistance	Present Resistance	% Change
140	12.3	9.47	- 23.0
140	2.5	2.33	- 6.7
140	13.5	8.96	- 33.5
140	19.5	10.02	- 48.5
140	8.3	9.17	+ 10.5
150	24.6	9.42	- 61.7
150	3.12	3.04	- 2.7

EUTAW SUBSTATION - AFTER 19 MONTHS

Depth	Initial Resistance	Present Resistance	% Change
63	1.38	1.36	- 1.5
57	2.4	2.1	- 4.5
60	2.24	2.06	- 8.0
60	1.81	1.7	- 6.2
59.5	1.44	1.4	- 2.8
60	1.70	1.7	0
48	3.54	3.52	- 0.7
60	1.92	1.89	- 1.6

Fig. 5—Rods which were connected so that they could easily be separated from the ground bus were rechecked and results are tabulated.

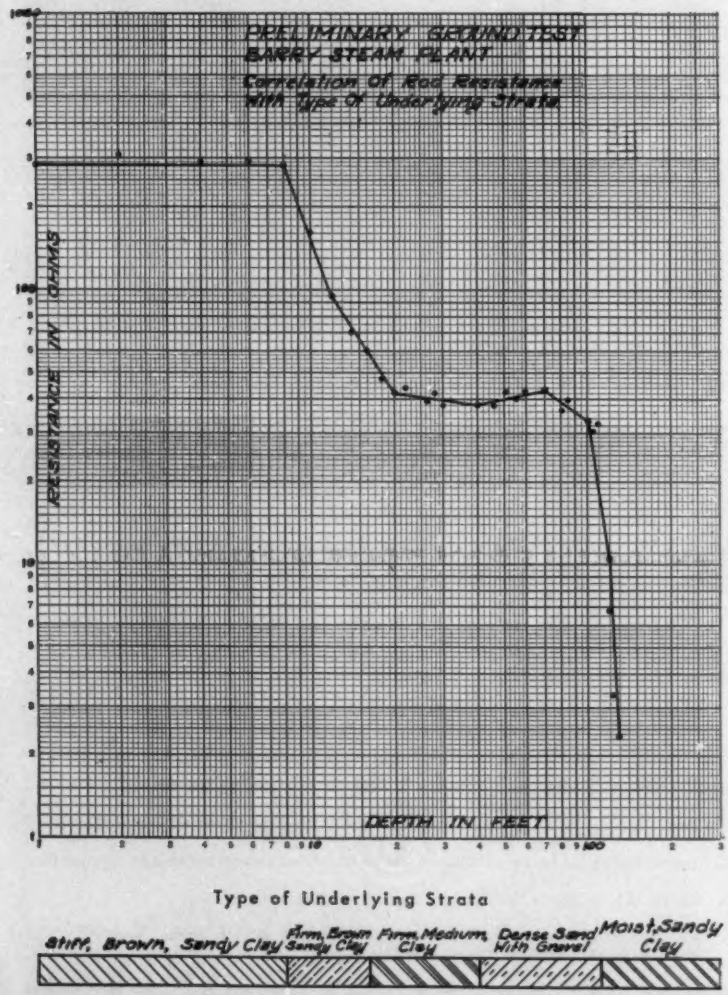


Fig. 6—A correlation of the resistance of a deep ground rod with earth core drilling data is shown here, shows how soils affect resistance.

After complete installation of all parts of the station ground bus, final tests are made to verify the design calculations.

Approximately eight years ago, it became apparent that it would be necessary to develop improved methods of obtaining low resistance ground fields, because of the pending construction of a new generating plant and several new substations in areas of known high resistance subsurface strata.

Until that time, the use of deep driven ground rods had not been too successful because of the physical problems in driving and the mechanical problem of maintaining the threaded coupling between sections of the driven rods.

The first attempt to improve the coupling was to cut out a section of the bronze coupling and to braze a solid connection between the coupling and the two rods.

This method was very slow and costly, but it was used extensively at one location where it was absolutely necessary to install rods to a depth of 100-140 feet to obtain a satisfactory resistance.

Exothermic weld used

Within the last five years, excellent results have been obtained from use of the exothermic type weld for joining rods. This is the type connection where ignition of powders causes super heat to fuse and hold the two rods together.

This connection is offered by two large manufacturers. After extensive tests of physical properties, both manufacturers' products are rated as equal for use on the Alabama Power Company system. Both manufacturers have made changes in the standard crucibles to improve this type of connection.

For driving the rods, it has been found that the pavement breaker type of air hammer which weighs approximately 65 pounds is best suited for substation rods. This hammer is powered by a portable gasoline driven air compressor.

This heavier type of hammer provides the high impact required to drive deep rods, but it complicates the method of supporting the hammer. Many types of supports have been suggested and used, but an arrangement has been most successful in substation work which uses a conventional "A" frame structure and winch cable on a truck which are standard equipment for each Alabama Power construction crew.

As more reliability is placed on the deep driven rods for the source of low resistance grounds, an at-

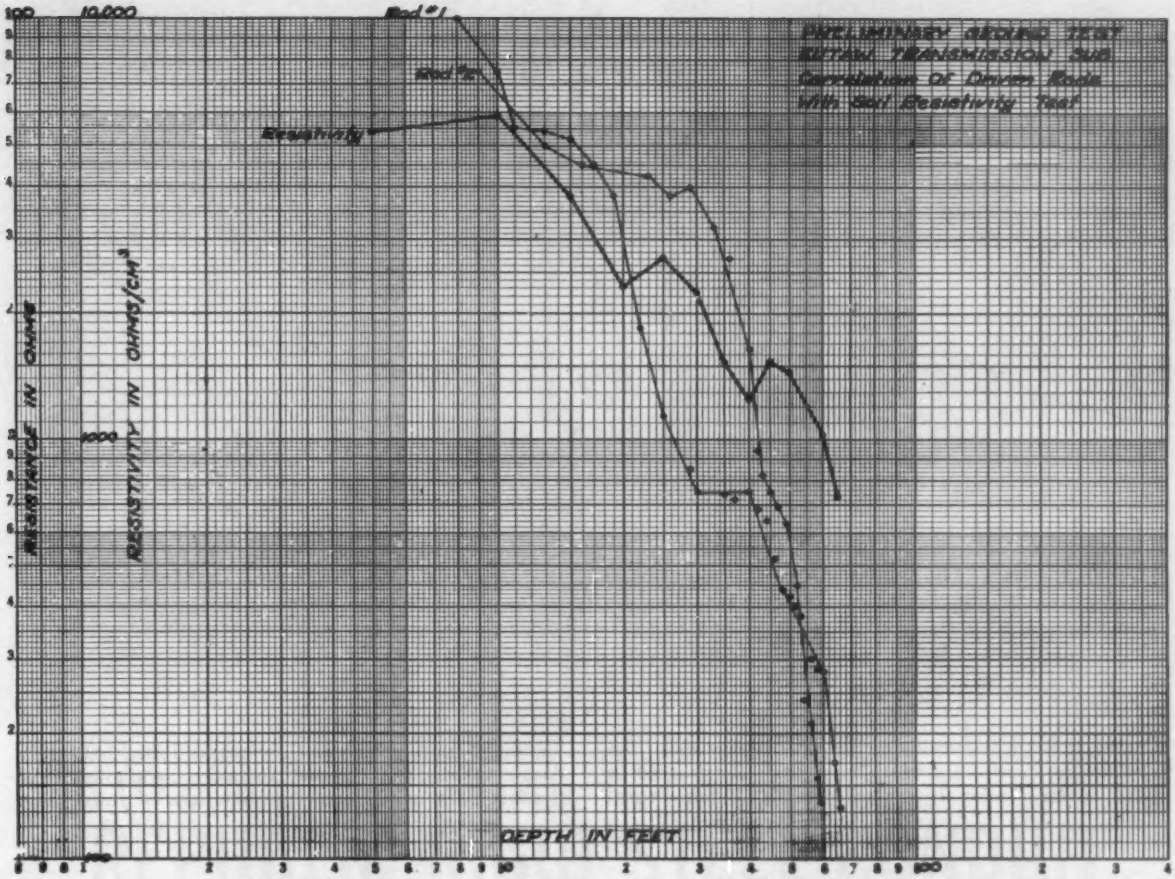


Fig. 7—Here the resistance curves of deep rods are compared with a composite soil resistivity curve which was made in the area which surrounds the substation. Different soil conditions are indicated by a similarity of the curves. Where equipment is not available to drive preliminary test rods, soil resistivity measurements, using the conventional four-pin method and a "Megger," can give an indication of different resistance strata.

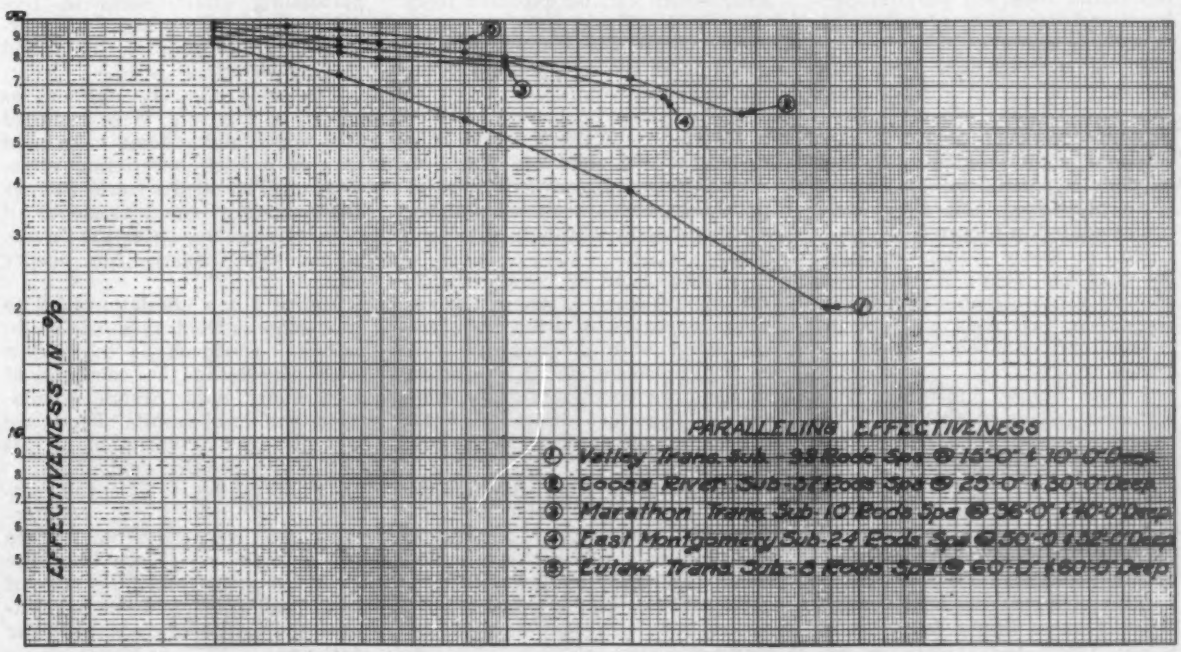

EFFECTIVENESS IN %
PARALLELING EFFECTIVENESS
① Valley Trans. Sub. - 38 Rods Spa @ 15'-0" & 10'-0" Deep
② Coosa River Sub - 37 Rods Spa @ 25'-0" & 80'-0" Deep
③ Marathon Trans. Sub. 10 Rods Spa @ 36'-0" & 40'-0" Deep
④ East Montgomery Sub. 24 Rods Spa @ 30'-0" & 32'-0" Deep
⑤ Eutaw Trans. Sub. - 8 Rods Spa @ 60'-0" & 160'-0" Deep

Fig. 8—Rods for all stations were installed at a depth and spacing calculated to give high paralleling effectiveness.

STATION & KVA CAP.	PRELIMINARY DATA			DESIGN CALCULATIONS					FINAL DATA				
	No. Of Rods	Average Depth (Feet)	Avg. Res. (Ohms)	Area Sq. Ft.	No. Of Rods	Average Depth (Feet)	Assumed Eff. (%)	Calc. R. Of All Rods (Ohms)	Average Rod Res. (Ohms)	Act. Eff. (%)	Actual Res. All Parallel Rods (Ohms)	Over-All Res. (Ohms)	Effect Of Cables, Counterpoise & OGW (%)
Eutaw 21,000 Kva	2	60	2.24	34,400	8	60	75%	.373	2.05	88.8	.27	.18	32.5%
Marathon 10,000 Kva	2	53	4.7	6,300	10	40	75%	.628	6.04	77.2	.68	.22	67.7% *
Valley 50,000 Kva	5	11.8	100.0	43,500	99	10	30%	3.37	116.0	20.6	5.7	.54	90.5%
E.Montgomery 20,000 Kva	3	58.4	23.9	43,800	24	52	50%	1.99	27.3	65.3	1.70	.60	64.7%
Thomasville 15,000 Kva	2	67	4.68	35,900	12	65	75%	1.85	-	-	-	.55	- **
Mt. Vernon 20,000 Kva	2	80	16.0	34,800	20	60	50%	1.6	15.4	12.4	6.05	1.42	76.5%
Jasper 15,000 Kva	10	10	45.0	39,600	37	10	50%	2.44	11.0	88.0	1.28	.97	24.2%

* - Large Customer Grounding
** - No Overhead Grounding Wire

Fig. 9—This is a tabulation of the data from some of the transmission substations which have been constructed in recent years. Shown is the relationship between preliminary design, design calculations, and the final results. Also emphasized is the need for more paralleling effectiveness data on different combinations of rods.

tempt has been made to compile data on the deep rods to aid in predicting their performance. Where schedules have permitted, extensive final tests in measuring individual rods and parallel combinations for effectiveness data have been made.

In two stations with deep rods, an easy means of disconnecting the rods from the ground bus was provided, so that periodic measurements could be made. Recently, all rods connected in this manner were rechecked and the results are tabulated in Figure 5.

At the Barry Substation after 80 months, four of the rods showed a considerable decrease in resistance, two rods a slight decrease, and one rod a slight increase.

At the Eutaw Substation, in a different section of Alabama, after 19 months, all rods except one showed a slight decrease in resistance. The initial readings were made shortly after installation and the present readings were made in August, 1960, during a very dry season.

It is difficult to explain the large decrease in the four rods at Barry. These tests verify, as expected, that a small decrease in rod resistance always occurs after a period of time as the rod establishes better contact for the full length with the surrounding earth.

This data typifies the performance which can be expected from deep rods. These rods are at a depth where seasonal changes of moisture in the soil have no effect on the rod resistance.

A correlation of the resistance of a deep ground rod with earth core drilling data is shown in Figure 6. This clearly indicates how the rod resistance changes as the bottom section passes through different soils.

Another type of comparison is shown in Figure 7, where the resistance curves of deep rods are compared with a composite soil resistivity curve which was made in the area surrounding the substation. There is a similarity of the curves which indicates different soil conditions.

For locations where equipment is not available to drive preliminary test rods, soil resistivity measurements using the conventional four-pin method with a "Megger" can give a general indication of different resistance strata of earth.

Paralleling effectiveness is an important factor in good design using deep rods. It is the ratio of the actual resistance of a group of rods to the calculated resistance.

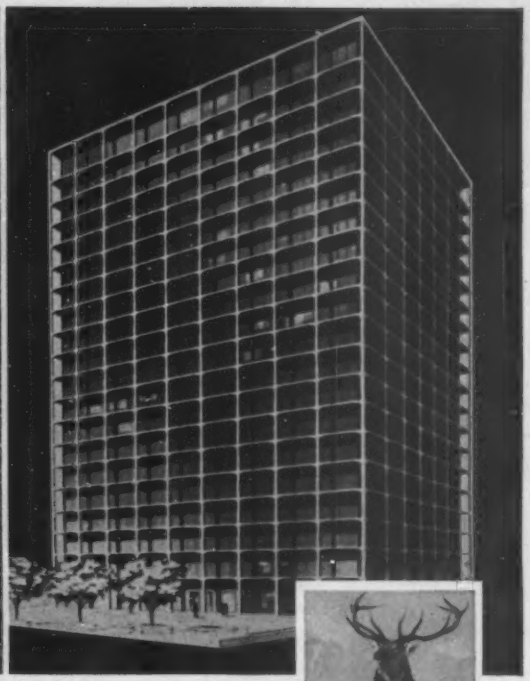
Figure 8 is a curve showing the paralleling effectiveness at five different stations with varying arrangements of number, depth, and spacing of rods.

The rods for all stations, as shown in Figure 8, were installed at a depth and spacing calculated to give a high paralleling effectiveness. The results were spacings approximately equal to depth of rods. However, note the much higher effectiveness for deeper rods.

Figure 9 is a tabulation of data from some of the transmission substations constructed in recent years. It shows the relations of preliminary data, design calculations, and final results. There are several items of variation in this data which require explanation.

At four of the stations, the combination of ground bus, counterpoise, and overhead ground wires had a lower resistance than the combined rods at the time of measurement. This seems to minimize the value of rods at those stations.

(Continued on page 125)



NEW HARTFORD BUILDING at 100 South Wacker Drive, Chicago, Illinois, to be occupied, in part, as Western Department Headquarters of Hartford Fire Insurance Company Group. George A. Fuller Company, General Contractor. Skidmore, Ownings & Merrill, Architect-Engineer. Emerson-Comstock Co., Inc., Electrical Contractor.

REPUBLIC RIGID STEEL CONDUIT

...lowers cost in high-rise buildings

Republic Rigid Steel Conduit goes in easily, quickly, assures trouble-free service in high-rise construction. That was the story at Chicago's new Hartford Building.

Installation was easy, bending was easy, because Republic Rigid Steel Conduit offers the highest degree of uniformity and ductility. Threads are clean, sharp, free-running. Welds are sound, smooth, strong. Surface is fully protected by a hot-dipped galvanized coating which will not peel, flake, or chip off under normal bending.

Highest quality Republic Rigid Steel Conduit is made of soft, ductile steel—produced by Republic's famous continuous weld process to meet severe service requirements. Fully tested, inspected, approved. Carries the seal of the Underwriter's Laboratories, Inc.

To learn more about Republic Rigid Steel Conduit advantages, call your Republic representative. Or, write direct.

Compatibility and strength characterize raceways made of

REPUBLIC STEEL
STEEL AND TUBES DIVISION
Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • DEPT. C-1960
227 EAST 131st STREET • CLEVELAND 8, OHIO

I want to learn more about the advantages of Republic Rigid Steel Conduit. Please send complete information.

Name _____ Title _____

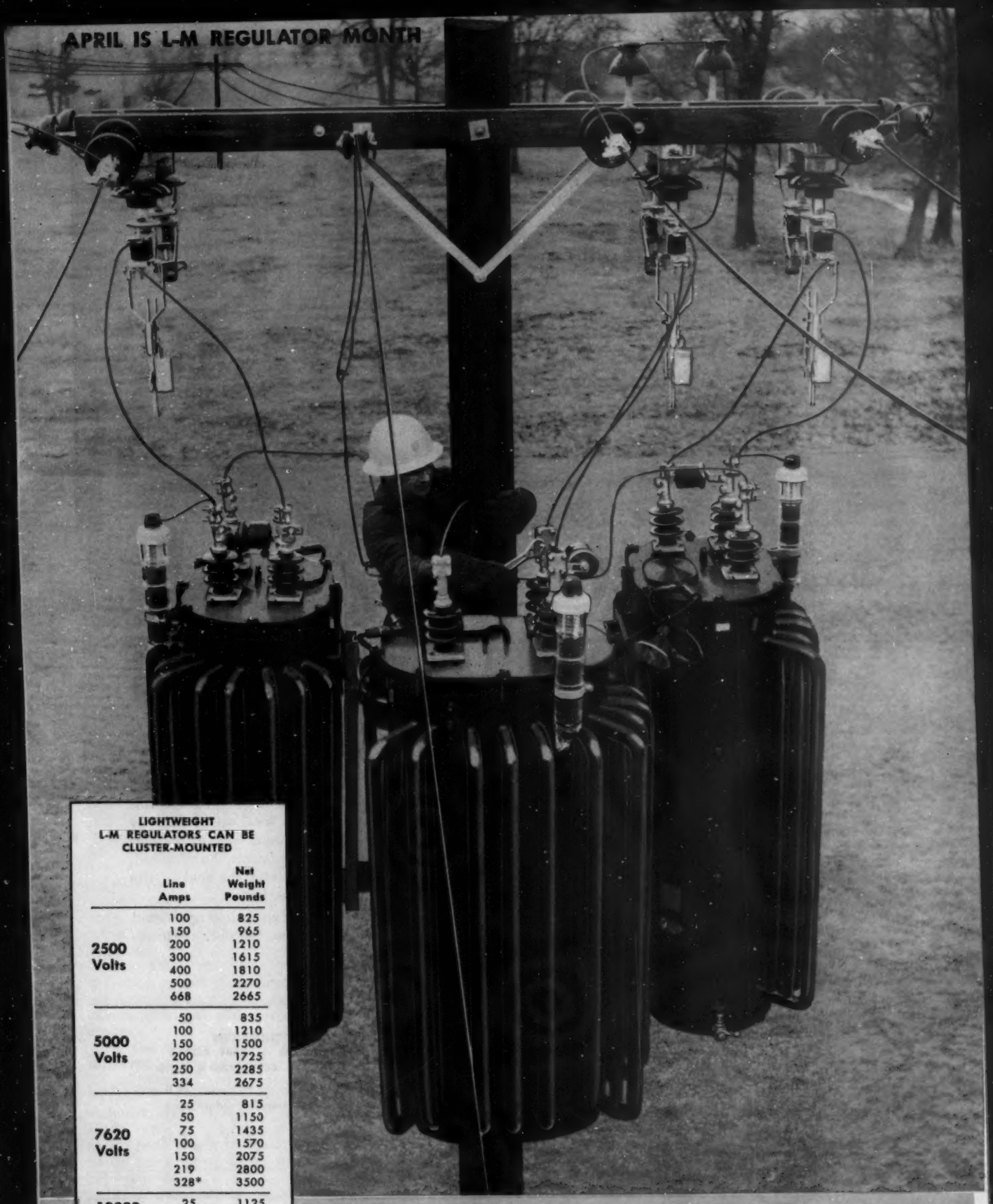
Firm _____

Address _____

City _____ Zone ____ State _____

For more details on above items, use reply card on page 27

APRIL IS L-M REGULATOR MONTH



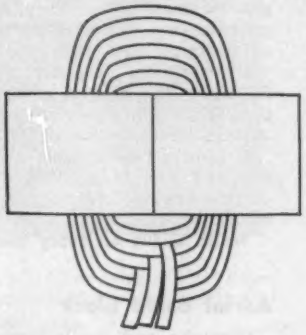
LIGHTWEIGHT L-M REGULATORS CAN BE CLUSTER-MOUNTED

	Line Amps	Net Weight Pounds
2500 Volts	100	825
	150	965
	200	1210
	300	1615
	400	1810
	500	2270
	668	2665
5000 Volts	50	835
	100	1210
	150	1500
	200	1725
	250	2285
	334	2675
7620 Volts	25	815
	50	1150
	75	1435
	100	1570
	150	2075
	219	2800
	328*	3500
13800 Volts	25	1125
	50	1540
	100	2475

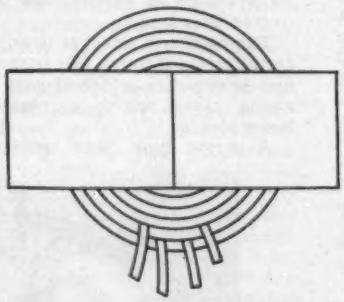
*NEMA standards do not provide for hanger brackets on this size.

5,000 KVA OF LOAD REGULATED FROM A SINGLE POLE! Here, three L-M 219 ampere, 7620 volt regulators are cluster mounted to provide regulation on a 7620/13200 volt multi-grounded wye distribution feeder.

HIGHER SHORT CIRCUIT STRENGTH



OTHERS—competitors wind regulator coils in a rectangular shape. Mechanical forces induced by short circuit current tend to stress these windings into a circular shape. Rectangular windings are less able to withstand these forces.



L-M—incorporates the exclusive Round-Wound design. Coils are circular in shape and are naturally capable of withstanding higher short circuit stresses.

MORE ACCURATE CONTROLS

L-M's exclusive induction-type contact-making voltmeter is a sealed watt-hour movement. It's more rugged, accurate and reliable than balanced-beam types. Band width is adjustable between ±¾ volt to ±6 volts, need not be recalibrated when voltage level is changed. No service interruption when band width is changed; no external voltmeter required; no need to set voltage knob at zero.

REMOTE CONTROL

L-M's control cabinet can be separated from the regulator tank. It may be mounted at any convenient location at or near base of pole. Connections between the regulator and the control cabinet are accomplished by a cable and connectors. Control cables and receptacles are available in a range of standard lengths.

Regulate Up to 5000 Kva of Line Load With L-M's Cluster-Mounted Regulators

Compact Round-Wound® design cuts weight of L-M 32-step voltage regulators for low-cost cluster-mount installations; also provides exceptionally high short-circuit strength.

B. R. BLAKE
Regulator Application Engineer
Line Material Industries

Line Material incorporates the exclusive Round-Wound design in all 32-step voltage regulators. As a result all regulators, with the exception of the largest size, can be either pole mounted or cluster mounted.

Now it is possible to provide regulation on lines in established areas where new construction is impossible. Cluster-mounted regulators not only save space, but also completely eliminate the real estate, construction, and labor costs associated with substation installation.

Get Complete Information

Your L-M Field Engineer will be glad to give you assistance and complete information on the application of L-M regulators. Or write Line Material Industries, P.O. Box 510, Zanesville, Ohio.

OUR 50TH YEAR 1911 — 1961

LINE MATERIAL® Industries *Regulators*

508 McGRAW-EDISON COMPANY

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT

New utility equipment

Holan aerial squirt boom

Holan Corp., 4100 W. 150th St., Cleveland 35, Ohio, is manufacturing a new aerial device that literally "squirts" a workman 40 feet into the air.

Known as the series 8000 squirt boom, the new Holan equipment can be operated by one man from controls located in the bucket. It is ideal for re-fusing transformers, group lamp replacement work, mid-span taps, installing electric service, and street light and signal work, according to the manufacturer.

The device incorporates several design features. Balanced engineering permits mounting of the unit on a 60-inch, 14,000-pound chassis. Holan-

designed torsion bars—attached to the base of the body—and the offset superstructure design, add stability in all operating positions and make outriggers unnecessary.

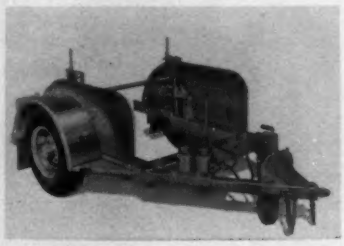
The fiberglass bucket, yoke, and boom can withstand a 73,000-volt a-c bucket-to-ground test. The fiberglass boom, by means of a double-acting hydraulic cylinder, extends ten-feet seven inches from the end of the main boom and can be stopped for work at any point in its travel.

Write U-401 on reply card, pg. 27

McCabe-Powers reel trailer

A new, economy-priced series RM Reel-Master hydraulic cable reel trailer, which can be operated by one man, was recently added to the complete line of Powers-American utility bodies, diggers, and derricks manufactured by McCabe-Powers Body Co., 5900 N. Broadway, St. Louis 15, Mo.

One man can load and attach the



Reel-Master to the towing vehicle without the help of a crane or winch. Two hand-operated pumps with independent hydraulic cylinders permit him to effortlessly elevate and level the reel to payout or travel position. A diverter valve permits operation of the landing wheel cylinder with the same pumps.

When it is necessary to park this trailer on uneven ground, the independently operated hydraulic cylinders raise or lower either side of the reel to facilitate removal or cable payout.

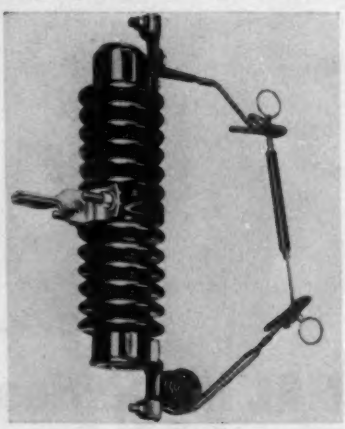
The trailers are available in three sizes, series RM-8, RM-10, and RM-12 for carrying reels up to 54 inches wide and 96 inches in diameter and weighing up to 8,000, 10,000, and 12,000 lbs.

Write U-402 on reply card, pg. 27

Hubbard flip-out cutout

An economical new flip-out cutout has been introduced by Hubbard and Co., 200 S. Michigan Ave., Chicago 4, Ill., for dependable protection of lines with low available short circuit currents.

This new flip-out is part of the company's Faultmaster line and is available in 7.8- and 15-kv ratings. The units carry catalog numbers 2598 and 2599, respectively.



Though design is simple and rugged for trouble-free duty, the cutout provides a number of features. One of these is sure grip contact arms which prevent fuse link ends from falling to the ground after interruption. This minimizes fire hazard and assures identification of the fuse link.

Double forked contact arms afford simple fusing from either side. These cutouts are also bird-proofed to avoid accidental grounding.

Write U-403 on reply card, pg. 27

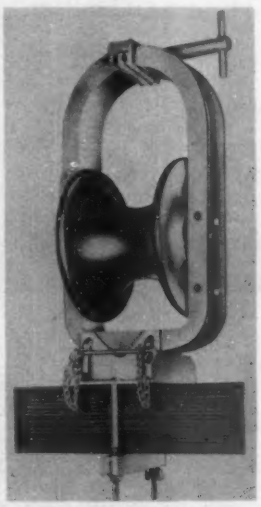
Aerial cable block

Sherman and Reilly, Inc., 1st and Broad Sts., Chattanooga 2, Tenn., now offers a new aerial cable block which can be crossarm mounted.

The frame of steel channel is drilled to provide dual pin mounting on brackets at vertical 45- and 90-degree positions.

The crossarm bracket is adjustable for all arms through five inches wide, and is securely attached with slotted swing plate, which eliminates any loose pieces.

A screw type head latch on the



device gives positive locking and easy opening. The block can also be locked on the messenger, or hung directly to the pole by use of an extra link.

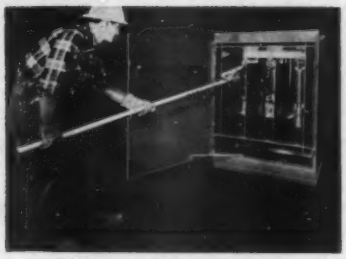
The block is made in a seven-inch size for cables through four inches in diameter, and in the ten-inch size for cables through six inches in diameter. Both sizes have type GNA permanently bonded Neoprene sheave lining.

Write U-404 on reply card, pg. 27

S&C pad-mounted gear

New pad-mounted gear has been introduced by S&C Electric Co., 4435 N. Ravenswood, Chicago 40, Ill., for switching, protecting, and isolating residential underground distribution circuits from 2.4 to 14.4 kv.

The new gear consists of fuses and disconnects expressly designed for



compact, air-filled enclosures. Basic applications are for transformers and for sectionalizing.

Sectionalizing applications are handled by complete, free-standing units supplied by S&C. Transformer primary applications are handled by the transformer manufacturer, who matches S&C fused disconnect components to his side bushing transformers and enclosures.

In either case, fuses and disconnects operate in air with completely visible circuitry. They can interrupt load, magnetizing, or charging currents when operated with Loadbuster, S&C's portable load break tool.

With Loadbuster, the gear will switch up to 400 amperes load current at 14.4 kv. Fuses are available up to 200E amperes continuous and 17,500 amperes, asymmetrical, interrupting. Boric acid fuses give low energy discharge when clearing faults. A wide choice of fuse ratings is available to permit close system coordination.

System growth can be accommodated because (1) the wide range of available fuse ratings permits changing capacity as easily as changing the fuses; (2) the enclosure is free standing, so it can be set up without a transformer initially; and (3) transformers can be added or changed out without disturbing cable connections.

Write U-405 on reply card, pg. 27

G-E switchboard instruments

A complete line of type AB-30 (a-c) and DB-30 (d-c) switchboard instruments is now available from General Electric, Instrument Dept., West Lynn, Mass.

Features of the instruments include one per cent accuracy range, savings from ten to 20 per cent in costs, and excellent readability.

Included in the type AB-30 instruments are voltmeters, ammeters, frequency meters, wattmeters, varmeters, power factor meters, and synchroscopes. Type DB-30 ammeters and voltmeters are also available.

Because of improved element and case design, type AB and DB-30 instruments permit savings of ten to 20 per cent in costs.

The AB, DB-30 line has the same 5.1-inch scale length as the rectangular switchboard instruments type AD-7 and DD-7, although the new line's flange dimension is only 4½ inches square compared to the 6½-inch by seven-inch design of the AD, DD-7 line.

The new switchboard instruments have a 180-degree scale. Excellent readability is provided by a convex-curved, shadowproof, molded lucite cover permitting wide angle (120-degree) reading. Scales and pointers mounted in the same plane eliminate paralax error. Element shielding permits mounting on magnetic or nonmagnetic panels.

Write U-406 on reply card, pg. 27

Chance snap-in wedge clamp

A new "snap-in" type wedge clamp for service entrance connections is now being manufactured by the A.

B. Chance Co., 210 N. Allen St., Centralia, Mo.

The clamp is quickly installed, as a squeeze securely snaps the stainless steel bail to the wedge after the bail has been looped through a wireholder. The conductor tension keeps the connection from uncoupling during service use.

The snap-in wedge clamps are made in two sizes—for conductor ranges of No. 6 to No. 2 ACSR and No. 4 to 1/0 ACSR.

Write U-407 on reply card, pg. 27

Ultrasonic generator

Another advance in solid state ultrasonic cleaning equipment has been announced by the Westinghouse Electric Corp., Electronic Equipment Dept., 2519 Wilkens Ave., Baltimore 3, Md., with the development of a new one-kw generator whose size has been cut 75 per cent and weight reduced by more than 50 per cent over present tube models.

At the same time, it was revealed the unit will feature the new Westinghouse Magnatrak circuitry to permit peak performance operation of the generator output and the cleaning action.

Elimination of a tuning knob, a meter, and one fuse from the genera-

Build lines to stay with

CHANCE ANCHORS

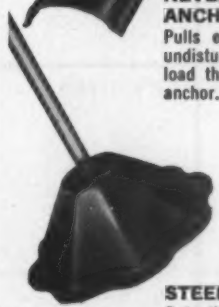
there's one for every need

8-WAY EXPANDING ANCHOR
Slips down a hole no bigger than the base plate. 8 rib reinforced blades expand into solid earth all the way around.

NO-WRENCH SCREW ANCHOR
Pitch-controlled blade goes down fast and adds to holding power. Can be installed by hand.

POWER INSTALLED SCREW ANCHOR
Lets you mechanize screw anchor installation with your power hole-digging equipment. Anchors install in 6 to 8 man minutes.

NEVER-CREEP ANCHOR
Pulls entirely against solid, undisturbed earth. Holds more load than any other type of anchor.



STEEL CONE ANCHOR
Cuts the costs of guying in hardpan, abode clay, or rocky soil. Gives exceptional holding strength.

EXPANDING ROCK ANCHOR
Expands and wedges against solid walls of rock. Does away with expensive lead or concrete grouting.

CA61-8

A. B. CHANCE CO.
CENTRALIA, MISSOURI
A. B. Chance Company of Canada, Ltd., Toronto

THE DIFFERENCE SHOWS UP HERE

Since 1896... MORE POWER TO YOU

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry and Electronic Applications

FACTORIES AT
ST. LOUIS 20, MISSOURI AND TORONTO, ONTARIO, CANADA

SALES OFFICES IN ALL PRINCIPAL CITIES

For more details on above items, use reply card on page 27

Your records know the difference between distribution transformers having a marginal design or a single outstanding feature—and distribution transformers having a well balanced design. If these records could speak they would tell you Moloney's Distribution Transformers give the tops in system efficiency, dependability and economy. Check the following Moloney features against the record—see how Moloney Transformers can hold down your costs and give a high rate of return on your investment.

ME61-4

MOLONEY FEATURES	YOUR BENEFITS
Low core loss • Low exciting current. Low copper loss	LOW OPERATING COST
Low impedance—good voltage regulation. High overload capability	INCREASED REVENUE
Duracoat Insulated Covers • High Impulse strength. Designed to withstand full short circuit. Extra insulation at all vulnerable points of the coil	FEWER OUTAGES
High strength bushings • Sealed tank-inhibited oil. Tough weather resistant paint. No external bushing mounting hardware. Cover fashioned to shed moisture. Heavy gauge steel tank and cover	MINIMUM MAINTENANCE
New shipping enclosure—reduces scrap—facilitates readying for installation. Transformer banded to shipping base for ease of handling after enclosure is removed	EASE OF HANDLING
Smoothly contoured hooks prevent sling abrasion. AL-CU Connectors • Single bolt handhole closure. Insulating cap on sidewall mounted H. V. bushings for clamping conductor without tools	QUICKLY INSTALLED
Low sound level • Dependable service. No radio frequency interference	SATISFIED CUSTOMERS

For more details on above items, use reply card on page 27

NEW SANGAMO STACK RACK CAPACITOR EQUIPMENTS

put more kilovars in less space

Here's the newest Sangamo development in capacitor stacking units . . . designed around the smaller and lighter Sangamo 50 kvar and 100 kvar capacitors. You get more kilovars in a given amount of space. For example, the new Sangamo stacking units with 100 kvar capacitors provide twice as many kvar as previous equipments, yet have the same length and height dimensions, and are only 12 inches wider.

There's a big weight reduction, too. Equipment weights with 50 kvar units are down 20 percent or more—those with 100 kvar units, down 25 percent or more.

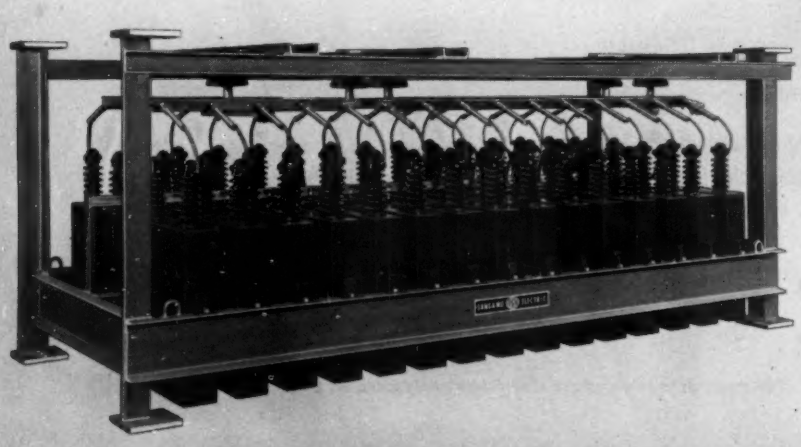
You'll save money, time, and substation space by stacking your kilovars with Sangamo stacking units. Compact and light, they permit better use of premium space, require minimum footing, and are easier to mount. Need less maintenance, too, because of stainless steel capacitor cases, all-welded aluminum rack construction, high structural strength, and non-ferrous fittings.

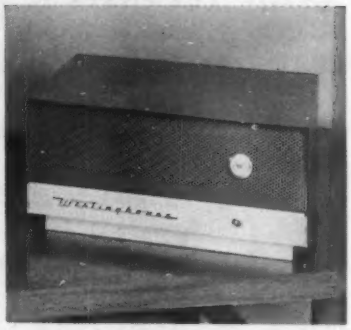
Remember, Sangamo equipments with 100 kvar units make it possible to use one rack where two were formerly required. This is especially important in 3-phase packaged substation equipments, and in some instances on large, high voltage stack rack installations.

Write us for further information.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

PC61-2





tor now requires an operator simply to use the on/off switch control to instantly begin cleaning a part or component. No warm-up time or tuning is required.

Also, the completely new design means the generator will require 25 per cent less power yet result in a significant increase in reliability and performance.

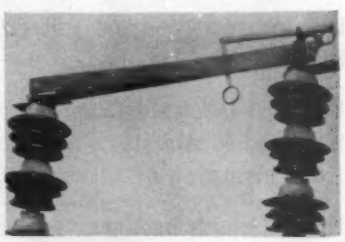
The generator will use 115-volt, 60-cycle power at a nominal frequency of 20 kc. It will be 8½ inches high, 17 inches wide, and 14 inches deep, and weigh 60 pounds.

Write U-408 on reply card, pg. 27

Royal disconnect switch

Royal Electric Manufacturing Co., Inc., 1122 E. 87th St., Chicago 19, Ill., has developed a new circuit breaker disconnect switch.

Mounted on two stacks of insulators, the Royal type BT disconnect switch incorporates a positive blade



latch on the front and back hinge contact, with a newly designed linkage to be operated from the bottom.

This heavy duty hook stick-operated disconnect switch in high capacity ratings is designed primarily for circuit breaker disconnects. It is available in all ratings, including the 138-kv, 1,600-amp design.

Write U-409 on reply card, pg. 27

Uptegraff transformers

A series of new compact pole type distribution transformers, designed for operation at 65 C temperature rise, has been announced by the R. E. Uptegraff Manufacturing Co., Scottdale, Pa.

These are not dual-rated 55/65 C transformers, but are completely new designs incorporating many innovations. Among these are low ratio of

full load copper loss to core loss, introduction of high temperature insulating materials, and reduction in size compared to conventional 55 C rise transformers of the same ratings.

These engineering innovations permit a reduction in price, more economical operation, and greater endurance in service.

There is less voltage drop at peak load and efficiency is high, resulting in greater operating revenue, better power characteristics, and greater tolerance for load growth. The smaller, lighter units are easier to handle, store, and install.

Write U-410 on reply card, pg. 27

L-M fast grounding switch

A new type PGH high-speed grounding switch is now being offered by Line Material Industries, 700 W. Michigan St., Milwaukee 1, Wis.

The new switch is designed to provide fast grounding of power system lines economically and reliably.

The units are actuated by a relay which senses a low-magnitude fault, such as an internal fault in a transformer. The six-cycle closing of the grounding switch quickly establishes a high-magnitude fault which can be sensed by the relay of a backup circuit breaker. Thus the effective range of a breaker can be extended economically.

Voltage ratings are 23-34.5 and 46-69 kv. Both units are rated at 20,000 amperes momentary closing current. Closing time of six cycles includes trip coil operation.

A PGH high-speed grounding switch, consisting of an oil-filled porcelain housing, internal contacts, and enclosed mechanism, can be mounted on a substation structure or separate pedestal. Units meet all NEMA and AIEE standards for high-speed grounding devices.

Write U-411 on reply card, pg. 27

G-E demand ammeter

General Electric's Voltage Regulator Product Section, Pittsfield, Mass., has announced a new demand ammeter for installation on voltage regulators.

Now available, at no increase in price, is a dual range five-ampere meter with an eight-ampere scale.

SANGAMO POLE-TYPE CAPACITOR EQUIPMENTS

Now, Sangamo pole-type capacitor equipments let you pack more kilovars into existing pole space. These new, all-welded aluminum rack equipments are more compact and weigh less because they are designed around Sangamo's smaller and lighter 50 kvar and 100 kvar capacitors. For example, the length of a 12-unit, 600 kvar rack with 50 kvar units has been cut by two feet, while its weight has been reduced by 20 percent over previous models. Still greater weight and length improvement is obtained with 100 kvar units. Reduced length and lower weight minimize both twisting and bending moment—make installation easier and lower in cost.

Sangamo pole-type equipments are available as both in-line and cluster mounts. Standard equipments with 50 kvar capacitors can carry up to 900 kvar in both types. Standard equipments with 100 kvar capacitors can carry up to 1200 kvar with the in-line rack; up to 1800 kvar with the cluster mount.

The in-line type has front-of-pole bracing to provide maximum climbing space free of grounds. 5 KV insulated stranded cable is used for unit and switch connections. Unswitched equipments have provisions for future addition of switches. All-welded aluminum racks, non-ferrous hardware and stainless steel capacitor cases keep maintenance costs down.

Write us for further information.

SANGAMO ELECTRIC COMPANY

PC61-1

SPRINGFIELD, ILLINOIS

The improvement permits high range readings up to 160 per cent load at full scale and low readings up to 80 per cent load at full scale.

The value of the meter comes from its flexibility in being able to provide accurate readings in the face of loads which may be above or below those for which the regulator is expressly designed.

The new meter utilizes the same adapter and socket as previous models, thus providing interchangeability.

Write U-412 on reply card, pg. 27

Kearney lightning arresters

A new line of distribution valve lightning arresters is now on the market from the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo.

Called the "Unigap," the new arrester line is available in three-, six-, nine-, ten-, 12-, 15-, and 18-kv ratings.

The arresters feature a new type of "unitized" gap construction in which the functions of both a spark gap and separate coil have been combined in a single, rigid, precision assembly. Rapid magnetic arc movement and power follow current interruption are accomplished without an auxiliary coil of any kind.

This new method of series gap construction insures precision spacing of gap electrodes, eliminates loose parts, and insures that the arrester's original characteristics will remain unaltered during shipment and after installation.

The unitized spark gap has been combined with an improved valve element matched to the interrupting ability of the gap structure.

The arrester incorporates low and consistent sparkover approaching or exceeding present ASA station arrester requirements, follow current interrupting ability ten times that required for average service, plus the ability to withstand the rigorous requirements of actual service conditions without change of characteristics.

Write U-413 on reply card, pg. 27

Tranter radiators

Tranter Manufacturing, Inc., Lansing 9, Mich., has announced the introduction of a new line of radiators for distribution transformer and small power transformer cooling.

Outstanding advantages of the new Flexoplate radiator line are savings in weight, compactness, low installation costs, application flexibility, and high cooling efficency.

Weight savings result from the plate type design and construction. Employing an oil film principle in relatively thin plates, Flexoplate radiators save weight in two ways. The radiators themselves are lighter than most conventional radiators and require a much smaller quantity of enclosed oil. The result is a radiator up to 40 per cent less in weight than most conventional designs.

Compactness is also achieved through utilization of the plate principle. A large extended cooling surface is provided in a small space.

Exceptionally simple installation of these radiators cuts costs. Each assembled radiator unit requires only two holes in the transformer tank and two welds. Low oil volume requirements produce further savings.

A range of plate widths, lengths, and number of plates per assembled radiator provides maximum flexibility for design purposes.

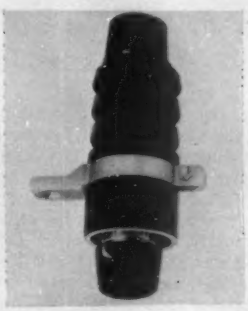
Write U-414 on reply card, pg. 27

Westinghouse arrester

An improved low-voltage arrester (three to 27 kv) from Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa., reduces impulse sparkover and discharge voltage characteristics by 20 per cent.

Size and weight are also reduced by 20 per cent, permitting easier handling and mounting, and using less room on the pole.

A unique nonexplosive dropout prevents line lockout in event of a damage arrester. Power follow current not "valved off" in ½ cycle after discharge of a lightning stroke actuates a thermal element in the dropout device to separate the ground stud from the arrester body. Gases inside the arrester escape during the dropout operation, preventing personnel handling hazards.



Effective creep distance from line to ground has been increased by 20 per cent. The new "undercut" skirt design is another first in distribution arrester design.

Double clamshell type terminals on line and ground studs hold one or two conductors from No. 6 solid to No. 2 stranded. Polyvinylchloride plastic caps cover line and ground terminals to protect linemen.

Triple seals on each end of the arrester lock out moisture.

Write U-415 on reply card, pg. 27

The Facts of Life in Street Light Control

1. Big killer of photo controls is transient voltage surges in secondaries which are below the spark-over of lightning arresters.

2. **LUMATROL MARK I** uses Varistors in conjunction with a secondary lightning arrester to withstand ALL transients up through the capabilities of the secondary arrester.

AUTOMATIC... COMPACT... LIGHTWEIGHT... SIMPLE... ...AND COMPLETELY RELIABLE!

WRITE FOR BULLETIN 91a.

MICRO BALANCING, INC.
GARDEN CITY PARK, N.Y.
In Canada: J. R. KEARNEY CORP.
Box 270, Guelph, Ont.

TWO HANDS

Can Make MORE PROFITS

With BRIEGEL

Indenter Tools and Fittings

There are but few products with which you can do a better job in less time at lower cost.

Used together, Original B-M Indenter Fittings and Tools will do just this and increase your profits from each installation.

BM-51
½" Offset Connector
BM-52
¾" Offset Connector

BM-41
½" Coupling
BM-42
¾" Coupling
BM-43
1" Coupling

Red Throat
BM-21B
½" Connector
BM-22B
¾" Connector
BM-23B
1" Connector

ALL BRIEGEL FITTINGS ARE U. L. APPROVED AS CONCRETE-TIGHT

BRIEGEL METHOD TOOL CO.

GALVA, ILLINOIS

All B-M indenter type fittings far exceed the requirements of U. L. file card E 10863 and Federal Specifications W-F-406.

USED THE MOST FROM COAST TO COAST

For more details on above items, use reply card on page 27

Know the law

by Arthur L. H. Street

Suppliers may collect from bonding company

THE NEW MEXICO Supreme Court recently upheld the right of an electrical supply company to collect from a bonding company.

The contractor for construction of a school building went bankrupt before fulfillment of the contract, and the indemnity company, which was surety on the contractor's performance bond, took over the contract and instructed the school district to employ a local man to correct a deficiency which subsequently arose in the work and to bill the indemnity company.

The school district employed the plaintiff and plaintiff corrected the deficiency under an independent agreement between plaintiff and indemnity company.

The indemnity company was liable to plaintiff, on the independent agreement, for the reasonable price of the services and material furnished (State of New Mexico v. Fireman's Fund Indemnity Co., 355 Pacific Reporter 2d 291).

State to hear dispute if NLRB declines case

LOUISIANA ELECTRICAL contractors sued in the state courts to enjoin defendants from picketing their jobs as a result of a labor dispute.

Because the contractors' business involved interstate commerce, the defendants contended that the case was subject to Federal, not state, jurisdiction.

Disposing of that point in the case of Derouen v. Lard, 121 Southern Reporter, 2d, 311, the Louisiana Court of Appeal, First Circuit, decided that because the suit proceeded on a theory that the picketing unlawfully restrained the contractors' business and was allegedly a continuing matter affecting interstate commerce, the contractors had a right to and should file a charge before the National Labor Relations Board for any act by defendants occurring after effective date of 1959 amendment to the National Labor Relations Act.

Then if the contractors' charge be dismissed because the Board declines to accept jurisdiction over the matter, then the state court would have jurisdiction.

State and city both may levy taxes on businesses

DOES THE FACT that a state imposes license taxes against the business of electrical contracting necessarily prevent a city from imposing like taxes?

No, decided the California District Court of Appeal, Second District, Los Angeles, in the case of Agnew v. City of Los Angeles, 323 Pac. 2d 165.

This article deals with the right of a city to impose *occupation taxes* on registered contractors.

The following will serve as an epitome of the general scheme of the taxing legislation here under consideration. A Los Angeles city license tax must be paid in advance annually by every person who is engaged within the city in a great variety of business activities. Contractors and independent contractors are among the businesses specified.

In the case of these businesses the tax is measured by annual gross receipts commencing with a license fee in the sum of $12 per calendar year for the first $12,000 or less of gross receipts. Upon the payment of the tax the City Clerk issues a "License Tax Registration Certificate" which remains in force and effect thereafter until suspended or revoked for the licensee's failure to pay such tax as may validly accrue in each subsequent year. Such revocation or suspension can be effected only after appropriate notice and hearing.

The Court of Appeal said:

"It is now well established that while a particular matter may be a state affair and subject to state regulation it is not immune from local taxation for revenue purposes where the tax does not interfere with the field pre-empted by the state . . . . The power of the City of Los Angeles to collect a license tax for revenue purposes was conferred upon it by the charter framed for its government, pursuant to the provisions of . . . our State Constitution.

"Such power is a 'municipal affair' within the meaning of that phrase as used in the Constitution, and therefore, cannot be withdrawn or abrogated by general laws enacted by the legislature . . . . Therefore, it cannot be said that the State Contractors Licensing Act (Bus. & Prof. Code, Sec. 7000 et seq.) was intended to have the effect of diminishing defendant city's power to tax for revenue purposes.

"The contractors license law was enacted for the basic purpose of protecting the general public against i m p o s i t i o n respecting structural improvements to real property in cases where special skill, training and ability are required, and its licensing requirements were adopted for the same purpose.

"Since defendant city's license tax registration certificate, as stated therein, . . . signifies that the person named on the face hereof has fulfilled the requirements of section 21.03 LAMC, by registering with the City Clerk for the purpose of paying license taxes for the classification of business for which the certificate is issued . . . it cannot be said that it purports either to authorize or prohibit anything in connection with the licensee's conduct of a lawful business in a lawful manner, nor does it seek to regulate the activities of a contractor in a field fully occupied by the state.

"The requirement of the Electrical Code of defendant city (Section 93.0501, supra) that the contractor shall furnish defendant city with his License Registration Certificate number does not therefore impinge upon the provisions of the general laws licensing electrical contractors.

"Appellant next contends that if defendant city is empowered to impose a business license tax, it

(Continued on page 124)

Don't blindfold him!

THE MAN in this picture is a cancer research scientist. The device he is using looks like something out of science fiction—but actually, it's an electron microscope. It shows the sub-microscopic detail of a cancer cell—magnified 100,000 times. *The cost of one electron microscope is $35,000.*

Some of the equipment needed for cancer research is even more expensive.

Today, in research centers throughout the country, 1300 scientists, supported by American Cancer Society funds, are at work searching for the cause of cancer—and, ultimately, ways to prevent it.

The American Cancer Society grants millions of dollars for research on such projects as the study of viruses as a possible cause of cancer—the development of hormone treatments for cancer—the control of cancer by drugs. *Life-and-death projects.*

Your help is needed to enable the American Cancer Society to continue this support.

Don't blindfold cancer research. Give to it. Send your contribution now, to CANCER, c/o your local post office. All gifts are tax-deductible.

AMERICAN CANCER SOCIETY

For more details on above items, use reply card on page 27

New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

CONDUIT, Pushing - UNDERGROUND with HYDRAULIC PRESSURE

ITEM	HRS. "C"	LABOR COST PER FT. AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
3/4"												
1 "	11.8	.236	.266	.295	.325	.354	.384	.413	.443	.472	.50	.53
1 1/4"	13.1	.262	.295	.328	.36	.393	.426	.459	.491	.52	.56	.59
1 1/2"	15.1	.302	.34	.378	.415	.453	.491	.53	.57	.60	.64	.68
2 "	16.4	.328	.369	.41	.451	.492	.53	.57	.62	.66	.70	.74
2 1/2"	17.7	.354	.398	.443	.487	.53	.58	.62	.66	.71	.75	.80
3 "	19.4	.388	.437	.485	.53	.58	.63	.68	.73	.78	.82	.87
3 1/2"	21.0	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
4 "	23.6	.472	.53	.59	.65	.71	.77	.83	.89	.94	1.00	1.06

E-101-B

LABOR: Includes setting up pusher, cutting and threading conduit and pushing conduit.

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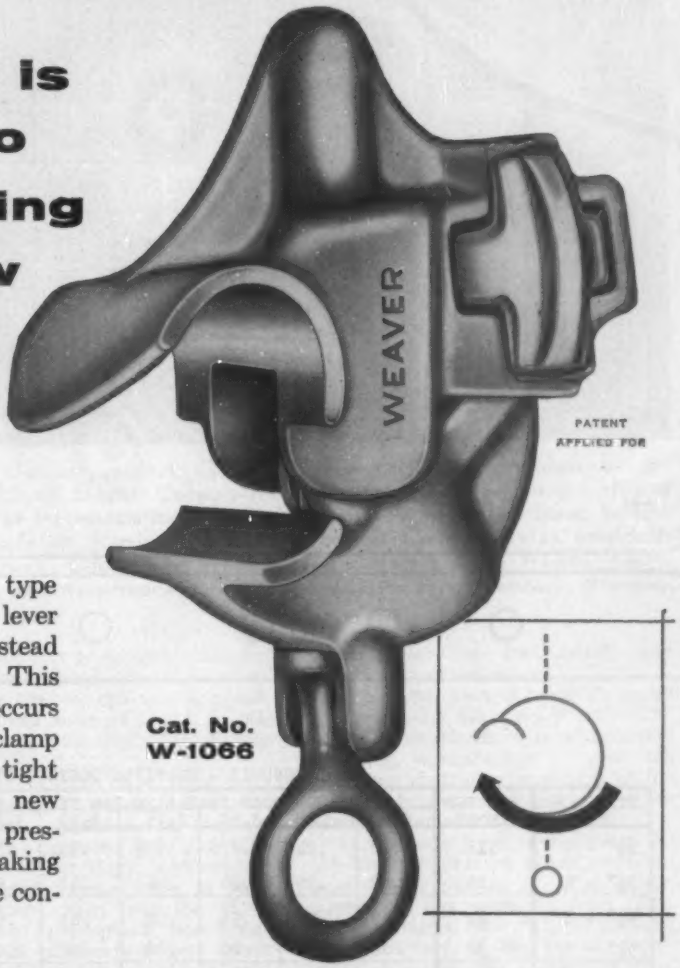
NEW TYPE HOT LINE CLAMP BY WEAVER

ASSURES BETTER, PERMANENT CONNECTION

...more pressure is transmitted to conductor by using an entirely new principle for hot line clamps



Cat. No. W-1066

WEAVER has developed a new type Aluminum Hot Line Clamp using the lever and fulcrum method for tightening instead of the ordinary straight line method. This principle eliminates the friction that occurs in the bolt-and-slider type of hot line clamp when the slider begins to pull up tight against the conductor. With the new WEAVER Hot Line Clamp, greater pressure is transmitted to the conductor making a higher conductivity, lower resistance connection... with less effort!

- Heavy duty spring assures constant contact pressure
- Fewer turns are required to open and close the clamp
- Two large grease recesses keep bolt fully lubricated ... won't drip at high temperatures
- Bell-mouthed and machined wire-bearing surfaces eliminate danger of damage to conductor
- Ears seat firmly in the hot stick and, when open, saddle drops out of the way for safe, easy installation
- Exceptionally long contact surface is the maximum length that can be tightened efficiently with one bolt
- Operates at a lower temperature than the conductor

Order From Your Electrical Wholesaler, or Write, Wire or Phone Collect for Additional Information and Sample

J. A. WEAVER Company

[illegible] • [illegible] • [illegible]

For more details on above items, use reply card on page 27

CLAY CONDUIT - SINGLE DUCTS - STANDARD LENGTHS

SIZE BORE	HRS. PER FT.	LABOR COST PER FOOT AT FOLLOWING RATES 2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
3 1/4 R	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
3 1/2 R	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
4 1/4 R	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
5 1/4 R	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
3 1/4 Sq	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
3 1/2 Sq	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
4 1/4 Sq	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
		SINGLE DUCT BENDS										
BORE RAD	PER EACH											
3½ 12"	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
3½ 18"	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
3½ 24"	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
3½ 36"	.26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
3½ 18"	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
3½ 24"	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
4½ 36"	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
3½ 36"	.26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
4½ 18"	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
4½ 24"	.26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17

E-102-B

LABOR: Includes preparation, laying, aligning, sealing joints.

4-61

Electrical Estimating—III

CLAY CONDUIT - MULTIPLE DUCTS - STD. LENGTHS

SIZE & NO. DUCTS	HRS PER FOOT	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES 2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
3½" - 2	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
3½" - 4	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
3½" - 6	21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
3½" - 9	32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
3½" - 2	21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
3½" - 4	26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
3½" - 5	32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
3½" - 9	37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
4½" - 2	26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
4½" - 4	32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
4½" - 6	37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
4½" - 9	42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89

E-101-B

LABOR: Includes preparation, laying, aligning and sealing joints.

4-61

Electrical Estimating—III

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News of the industry

edited for Southern readers

NRECA 19th convention looks at power status

NEARLY 8,000 MEMBERS of the National Rural Electric Cooperative Association met for their 19th annual convention recently in Dallas, Texas, to hear high ranking industry and government officials urge them on to even greater achievements.

The organization also elected a new slate of officers. R. A. Yarbrough, Childress, Texas, was named new president of the association; and Paul Tidwell, Centerville, Tenn., was elected vice-president. Al Hauffe, Leota, S. Dak., was named secretary-treasurer.

Addressing the assembly, Clyde Ellis, general manager of the NRECA, said that although power sales are up, power supply is critical. He said also that the association is gaining more members and more customers, but that they are also losing a great many customers and are constantly being raided by other power distributors.

Speaking on wholesale power, Mr. Ellis revealed that last year rural cooperatives bought 37 per cent of their power from commercial power companies, 46 per cent from government power agencies, and generated about 16 per cent themselves.

It was also pointed out that rural people purchased more than a billion dollars worth of electric appliances during 1960.

Walter Harrison, Millen, Ga., left, immediate past president of the National Rural Electric Cooperative Association, stands beside new officers elected at the association's 1961 annual meeting in Dallas, Texas. Left to right beside Mr. Harrison are R. A. Yarbrough, Childress, Texas, president; Paul Tidwell, Centerville, Tenn., vice-president; and Al Hauffe, Leota, S. Dak., secretary-treasurer. Some 8,000 association members attended.

Road lighting justified by accident prevention

THE LIGHTING OF CRITICAL sections of highways is fully justified by the night accidents it prevents, according to new findings of the Committee on Highway Illumination of the American Road Builders Association.

Herbert A. Friede, chairman of the committee, said that studies in Connecticut have established that lighting reduces night accidents 25 per cent on highways and 60 per cent in urban areas.

"Applying these percentages to accurate accident costs shows that lighting is economically justified," Mr. Friede pointed out.

He said that studies by the Highway Research Board of accidents in Utah for 1953 and in Massachusetts for 1955 fixed costs as $5,213 for a fatal injury accident, $1,277 for a non-fatal injury accident, and $299 for a property damage accident.

"Figuring that costs have risen ten per cent since these exhaustive studies were made, we can now establish these accident costs as $5,734, $1,394, and $328, respectively," Mr. Friede said.

Highway officials now have reliable statistics on which to base decisions with respect to lighting. In Mr. Friede's opinion, they can take their figures for night accident locations, apply these costs to each type accident, then take the 85 or 60 accident prevention percentage and see for themselves how much roadway lighting the accident prevention would buy.

Mr. Friede said his committee is continuing its aggressive program of information development to aid state highway officials.

Adequate Wiring Bureau formed in Louisville, Ky.

AN ADEQUATE WIRING Bureau to promote "Medallion Wiring" has been recently formed by the Electrical Clearing House of Louisville, Ky.

Considered one of the most ambitious programs of adequate wiring promotion yet undertaken in this region, the program will be aimed toward the general public as well as toward builders, architects, appliance dealers, lending institutions, and electrical contractors.

Full cooperation is being given by the Louisville Gas and Electric Co., electrical wholesalers, manufacturers agencies, manufacturers, and the electrical contractor members of the clearing house, the counterpart of the electric league in other cities.

At the same time, new officers for the Electric Clearing House were announced, including E. F. Locher, president, who succeeds John Link. Others named were Leo Schlaug, vice-president; Walter Roach, secretary-treasurer; and Thomas Morton, sergeant-at-arms.

Also set up was a plan for seven committees, through which the Adequate Wiring Bureau can function. In addition to the executive committee, groups will cover the following areas: advertising and promotion, home builders, electrical contractors and membership, news letters and information, financing, ways and means, and adequately wired and Medallion homes.

Ga. Tech sets meeting on protective relaying

THE 1961 PROTECTIVE Relaying Conference has been scheduled for the Georgia Tech campus, Atlanta, Ga.,

in the Architecture Auditorium, May 4-5.

The program is held annually by Georgia Tech's School of Electrical Engineering and the Engineering Experiment Station.

Details can be obtained from the Director, Short Courses and Conferences, Georgia Tech, Atlanta 13, Ga.

New headquarters built by Hunzicker Brothers

AN ESTIMATED 800 persons visited the new lighting fixture display room and other major expansion and redecorating changes in the offices of Hunzicker Brothers Electric Supply Co., Oklahoma City, Okla., recently.

Also on hand were nearly 40 manufacturers' representatives and sales engineers with exhibits in the counter sales area and in the adjoining 58,000 square foot warehouse.

The company, with 30 employees, is one of the oldest and largest electrical distributing firms in Oklahoma and was founded by an uncle and the father of W. W. Hunzicker, Sr., who bought the firm in 1927. He was joined by his son, Walter W. Hunzicker, Jr., in 1939, as partner. A fourth generation of the family is now associated with the company, F. W. "Fritz" Hunzicker.

Maxine Briggs, lighting consultant, who has been with the firm for nearly 25 years, said that the new display room is one of the best stocked showrooms of its type in Oklahoma. She is the recipient of several national awards for her outstanding work in lighting design and installation.

Left to right, W. W. Hunzicker, Sr., and Walter W. Hunzicker, Jr., receive congratulations on their new lighting fixture showroom from Jack Johnson, representative for Thomas Industries in Oklahoma and Arkansas, and Stan Foster, representative for Lightolier in Oklahoma and west Texas.

NECA District III to meet in Jackson

THE NATIONAL ELECTRICAL Contractors Association, District III, will hold a meeting in Jackson, Miss., April 16-19, 1961.

Sessions will be conducted at the King Edward Hotel.

Allis-Chalmers offers fuel cell demonstrator

ALLIS - CHALMERS Manufacturing Co., 938 S. 70th St., Milwaukee 1, Wis., recently made available a working model fuel cell demonstrator for instructional and educational purposes, which is one of the first mass produced fuel cells in history.

The tabletop demonstrator kit turns chemical energy directly into electrical energy.

The kit contains two major components, the fuel cell (housing and electrode plates) and a small electric motor, plus leads.

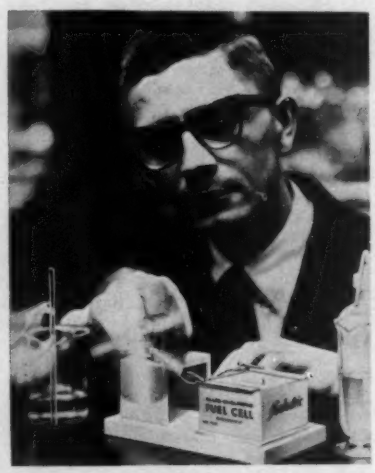
The entire assembly measures seven inches in length, 3½ inches in width, and 5½ inches in height, including a propeller for attachment to the motor shaft.

Complete instructions for assembly and operation of the fuel cell demonstrator are included. A wall chart presents an enlarged, schematic diagram of the system and traces the complete reaction involved in changing chemical energy to electrical.

Easily obtainable chemical ingredients, an electrolyte of potassium or sodium hydroxide, an alcohol fuel, and hydrogen peroxide as the oxidant, are readily available in the high school chemistry laboratory. Also included are complete instructions for measuring and mixing these ingredients.

The combined ingredients react with the catalyzed electrode surface to produce current flow. Catalysts are platinum for the fuel and silver for the oxidant. The direct current produced by the reaction drives the small motor, which can be turned on and off by a switch mounted in the motor stand.

This offering to the educational field is designed to supplement the limited text material available in science classes. Demonstration kits, less chemical ingredients, are available for immediate delivery for classroom instruction and educational presentations.



Whirring blades and flying pennants signal the generation of electrical power from one of the first mass-produced fuel cells in history.

Guth names G. Arnold as new representative

THE EDWIN F. GUTH Co., St. Louis, Mo., has named Glenn H. Arnold as their new manufacturer's agent to cover Georgia and the southern part of South Carolina.

Mr. Arnold's background includes experience in working with architects, engineers, contractors, and electrical distributors.

Plenty of parking space is now available in front of the large new building of Roden Electrical Supply Co., Knoxville, Tenn. Sales have increased.

New site raises profits for electric supply firm

LOCATING HIS COMPANY on a new site with modern facilities and plenty of parking space has paid off for H. D. Roden, president of Roden Electrical Supply Co., Knoxville, Tenn.

After moving from an old cramped two-story building where parking was limited, to a new location at Oklahoma and Wray St., sales went up and insurance rates went down.

"Everything is now on one floor, which gives ease of operating," Mr. Roden said, "With 20,000 square feet in our new building, we have complete lighting fixture displays—over 300 fixtures. Electrical contractors and home builders can bring their customers, park easily, and without loss of time show the customers the lighting fixtures available or built-in appliances."

The company has also built an electrical counter and an electronics department and counter. Two-way radios installed in delivery trucks help distribute this equipment and speed up service.

Wholesale distribution theme of NAED meet

SPEAKERS HAVE BEEN announced for the 53rd annual convention of the National Association of Electrical Distributors, to be held in Detroit, starting on Saturday, April 29, and concluding at Wednesday noon, May 3.

The theme for this general NAED meeting is "Wholesale Distribution—the key to Efficient Marketing."

Convention sessions and the manufacturers' conference booth activities will be held in Detroit's newly opened Cobo Hall. Convention head-

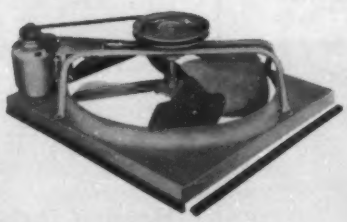
Chelsea

A COMPLETE LINE OF QUALITY VENTILATING EQUIPMENT

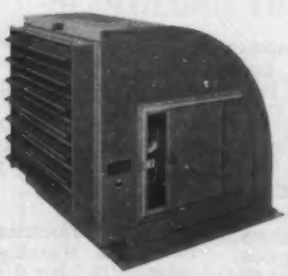
Packed with features that SELL!
Priced for Profits that SOAR!

Air circulators for Pedestal, wall, counter or ceiling mounting.

Kitchen Fans



Deluxe and Project Attic Fans for wall or ceiling mounting 24"-60"



Axial and Centrifugal Roof Ventilators 150-50,000 CFM

Belt and Direct Drive Industrial Fans 12"-108"

Offering the most complete line of ventilation equipment in the industry for 35 years, during which period fans and blowers have been our only product thus assuring 100% concentration of engineering and production time and talent to the solving of ventilating problems and producing the finest equipment available. And the entire line of commercial, industrial and residential equipment is priced right too—priced to sell. Send for your copy of our new 1961 catalog.

CHELSEA
FAN & BLOWER CO., INC.
PLAINFIELD, NEW JERSEY
REFER TO THE LISTING OF CHELSEA MANUFACTURERS' AGENTS IN THIS ISSUE

quarters will be located jointly in the Sheraton-Cadillac and the Statler Hilton.

Among the principal speakers at the convention are the following: Dr. Kenneth McFarland, educational consultant and guest lecturer, General Motors Corp., Detroit; W. H. Gove, president, Bill Gove Organization, Sales Research & Development, Coral Gables, Fla.; R. J. Eggert, marketing research manager, Ford Motor Co., Detroit; J. A. Meier, president, National Association of Electrical Distributors; and the Rev. Robert Bruce Pierce, Metropolitan Methodist Church, Detroit.

In addition to these, and other speakers yet to be announced, there will be a panel presentation on the electrical wholesalers' place in the distribution of industrial electronics products. There also will be a special presentation on electric heating.

Kaufman enters field of fabricating metals

FULL-SCALE PRODUCTION is now underway at Kaufman Enterprises, Inc., new metals fabrication and manufacturing company at Kaufman, Texas.

The new firm, occupying approximately 50,000 square feet, will specialize in design and fabrication of electrical transmission towers, switchyard structures, and substations, President R. J. Van Somer of Dallas announced. The company will also offer complete fabrication and design services for all types of steel and aluminum structural components, he said.

R. J. Van Somer

Initial production began in December, 1960, after the firm was capitalized earlier in the year. Work on initial tower contracts was followed by an increase in production during January and February.

"Our tower and substation designs feature an economy in weight without sacrifice of strength and durability," Mr. Van Somer explained, "thus passing on the economy in materials to the customer. Tower and other products will also be fabricated to meet the customer's own design and specifications."

D. E. King

Mr. Van Somer has a background of 16 years as a structural designer and engineer in the metals fabrication field. Both he and Executive Vice-President D. E. King of Dallas were formerly associated with Anchor Metals Division of D. S. Kennedy & Co., Hurst, Texas, a transmission tower fabrication firm.

Dates ahead

IAEI, Ellis Cannady Chapter, Carolina Hotel, Raleigh, N. C., April 12-13, 1961.

Missouri Valley Electric Assn., Engineering Conference, President Hotel and Municipal Auditorium, Kansas City, Mo., April 12-14, 1961.

Southeastern Electric Exchange, Engineering & Operation Section, Hollywood Beach Hotel, Hollywood, Fla., April 12-15, 1961.

IES Southwestern Regional Conference, Skirvin Hotel, Oklahoma City, Okla., April 16-18, 1961.

National Association of Electrical Contractors, District III meeting, King Edward Hotel, Jackson, Miss., April 16-19.

IAEI, Alabama Chapter, Tutwiler Hotel, Birmingham, Ala., April 17-18, 1961.

Fourteenth Annual Conference for Protective Relay Engineers, Agricultural and Mechanical College of Texas, College Station, Texas, April 17-19, 1961.

Alabama Electrical and Electronics Exposition, Second Annual Exposition, Birmingham City Auditorium Convention Hall, Birmingham, Ala., April 17-19, 1961.

IES Southeastern Regional Conference, Atlanta Biltmore Hotel, Atlanta, Ga., April 19-21, 1961.

IAEI, South Carolina Chapter, Cabana Inn, Spartanburg, S. C., April 20-21, 1961.

IAEI Five - Chapter Joint Meeting—Baton Rouge, George Welman, North Louisiana-East Texas, Texas, and Texas Gulf Coast Chapters—Windsor Hotel, Abilene, Tex., April 28-29, 1961.

National Assn. of Electrical Distributors, Annual Convention, Detroit, Mich., April 29-May 3, 1961.

Protective Relaying Conference, Georgia Tech, Architecture Auditorium, May 4-5, 1961.

IAEI, Florida Chapter, Casa Marina Hotel, Key West, Fla., May 5-6, 1961.

IAEI, Executive Council, Statler Hotel, Detroit, Mich., May 14-19, 1961.

IAEI, Virginia Chapter, Hotel Roanoke, Roanoke, Va., June 12-13, 1961.

AIEE Summer General Meeting, Cornell University, Ithaca, N. Y., June 18-23, 1961.

IES National Technical Conference, Chase Park Plaza Hotel, St. Louis, Mo., Sept. 24-29, 1961.

National Electrical Contractors Assn., Washington, D. C., week of October 9, 1961.

AIEE Fall General Meeting, Statler-Hilton Hotel, Detroit, Mich., Oct. 15-20, 1961.

IAEI, Southern Section, Grove Park Inn, Asheville, N. C., Oct. 16-18, 1961.

Hendrix installation tests aerial cables

TWO SPANS (280 feet total length) of 24,000- and 35,000-volt aerial cable are both now under test at Milford, N. H., by the Hendrix Wire and Cable Corp.

They are energized with three five-kva distribution transformers, wye connected to give 20,000 volts be-

tween each conductor and the grounded messenger and 34,640 volts between phase conductors.

Both cables are 336,400 CM compressed aluminum and employ high density track resisting polyethylene for the outside layer of insulation.

Russell and Stoll agent adds Stewart to firm

ROBERT S. MORRISON, Russell and Stoll Company representative for the state of Alabama, has announced a reorganization of his firm, with the addition of Joseph P. Stewart.

The organization's new name will be Morrison and Stewart, with offices and warehouse at 1929 Cahaba Rd., Birmingham, Ala.

Brief news notes of manufacturers

J. A. WEAVER Co., St. Louis, manufacturers of electrical fittings, has started production in their new foundry located immediately adjacent to their present plant at 2110 Howard St.

This recently completed addition to the Weaver Company is one of the most fully automated non-ferrous foundries in the Midwest, and will more than double Weaver's present production capacity. Along with the modern production equipment, the new building houses foundry offices and a complete laboratory.

* * *

A NEW BRANCH office has been established in Charleston, W. Va., by the Okonite Co., wire and cable manufacturing subsidiary of Kennecott Copper Corp.

John P. Oblinger, who formerly served the West Virginia area from Bluefield, Va., is now located at 1799 Huber Rd., Charleston 4, W. Va.

* * *

DAVID R. CAPLAN, 939 Washington St., Hollywood, Fla., has been appointed the representative for Del-Val Manufacturing Co.

He will cover the entire state of Florida. Until recently, Mr. Caplan represented another fixture line, and is well known among electrical wholesalers.

* * *

MID-SOUTH SALES, INC., 4828 Parkside Ave., Memphis, Tenn., has been named a sales agent for Killark Electric Manufacturing Co., St. Louis, according to an announcement by J. C. Grindell, Killark vice-president in charge of sales.

Mid-South Sales, Inc., is operated by Joseph F. Devereux, well-known electrical equipment representative. Assigned territory includes western Tennessee, northern Mississippi, and all of Arkansas. The new representative will handle Killark's entire line of aluminum conduit fittings, light fixtures, and other types of electrical enclosures.

* * *

FISHER-PIERCE, manufacturers of electrical and electronic equipment for utilities, industry, and the home, has appointed Bowen-Arnold Agency as a sales representative.

Bowen-Arnold will handle the complete Fisher-Pierce line of photoelectric streetlighting controls and associated equipment, and will cover all of Florida except the area west of the Apalachicola River.

The agency has two offices: one at 190 S. E. 14th Terrace, Miami; and one at 4228 Cortez Way S., St. Petersburg.

The Fisher-Pierce Division of Sigma Instruments, Inc., is located at South Braintree, Mass., and now has a total of 26 sales representative organizations throughout the United States and Canada.

* * *

GEDNEY ELECTRIC Company has appointed H & C Electric Sales Co., 1206 Myrtle Ave., El Paso, Texas, as agent.

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28 PAGE
CABLE TRAY CATALOG

Completely illustrated with full data and specifications on:
GLOBETRAY . . . the Superior Ladder type tray.
CABLE-STRUT . . . the Superior Basket type tray.
(Interchangeable at any point in the system.)

A must for architects, consulting engineers, and designers interested in trays for the support of cables, wiring and tubing used for power and communication instrumentation, where speedier installation is desired. A full line of accessories is available.

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VULCAN TUBULAR HEATERS

You can get just about any shape you want with Vulcan Tubular Elements to heat all kinds of forms including unusual types. You can cast the heaters into aluminum or other metals. You can immerse them in liquids, soft metals or molten salts. You can clamp straight tubular heaters to metal surfaces or insert them in machined grooves. And you can get them with flattened surfaces for even greater effective heat transfer.

Write for catalog VG-201 containing specifications and prices.

VULCAN *Versatility in Electric Heating*

VULCAN ELECTRIC COMPANY, DANVERS, MASS.

For more details on above items, use reply card on page 27

News about people

Appointment of **Garland S. Landrith, Jr.,** as general manager of Power & Light Exhibit, Inc., which will administer the investor-owned electric utility industry's participation in the New York 1964-1965 World's Fair, was announced by **Ernest R. Acker,** president of P&LE and chairman of the board of Central Hudson Gas & Electric Corp.

In his new assignment, Mr. Landrith will supervise arrangements and activities in connection with the designing, erecting, operating, and maintaining of the industry's World's Fair exhibit.

A graduate of the United States Military Academy, Mr. Landrith received his MS degree in mining engineering from the Colorado School of Mines in 1951. Following graduation in 1953 from the Advanced Officer Course of the U. S. Army Engineering School, he served as an adviser to the Chinese Army in Formosa until 1955.

After graduation from the Command and General Staff College of Fort Leavenworth, Kansas, in 1956, Mr. Landrith taught engineering at West Point until he joined the Edison Electric Institute in 1957.

Andrew J. Haswell, vice-president of the Oklahoma Gas and Electric Co., recently took over the direct executive responsibility for the company's Oklahoma City and Western division operations, and now has general responsibility for personnel administration as well as the company's six geographical divisions.

In announcing Mr. Haswell's promotion, the OG&E board of directors named **Clarence Anthony,** formerly an operations executive assistant, a vice-president to take over some of Mr. Haswell's former assignments. Mr. Anthony will be responsible for transmission and distribution, generation, engineering, construction, and transportation.

Mr. Haswell has been a member of OG&E since 1923, and headed the personnel department before being elected a vice-president in 1957. Mr. Anthony joined OG&E in 1935, working up through the company's general repair shops and transmission and distribution department before being named an executive assistant.

Charles A. Schmidt has been named vice-president in charge of sales for Mears Controls, Inc., **John S. Mears,** president of the firm, announced recently.

Charles A. Schmidt

His headquarters will be located in Westfield, N. J.

A graduate of Penn State University, Mr. Schmidt served Westinghouse Electric Corporation for 20 years, then joined Federal Pacific Electric Co., where he served on the board of that company's Canadian Div.

Appointment of **George Cheyne** to the newly created position of product specialist, Residential Heating Div., has been announced by **E. N. Calhoun,** president, Edwin L. Wiegand Co., Pittsburgh, Pa.

Mr. Cheyne will contact distributors, electrical contractors, and builders in connection with sales of Chromalox home heating equipment. He formerly was vice-president, sales, of Electrend Products Corp., St. Joseph, Mich.

Richard Kimmel has been named advertising manager of American Steel and Wire, succeeding **Orton B. Stauffer** who has resigned, it was announced recently by **W. H. Guterl,** manager of marketing for this U. S. Steel Div. Mr. Kimmel received his higher education at Dartmouth College, from which he earned a BA degree in economics.

Following World War II, Mr. Kimmel joined American Steel and Wire in Cleveland as a junior sales analyst in the sales statistics department. In September of 1959, he was named coordinator for Cyclone products in the Wire Division's Cleveland headquarters office. He was serving in that capacity at the time of his new appointment.

Richard Kimmel

The retirement of **Ralph H. Earle** from the position of manager of engineering development was announced recently by Line Material Industries.

Mr. Earle's outstanding contributions to the electric power industry through the last 44 years, as well as his active role in establishing industry technical standards, have marked his career with distinction.

In recognition of his achievement he was made a Fellow of the AIEE in 1959, with the citation, "For basic contributions to the development of equipments for the generation and distribution of electric power." Earlier the same year he was cited by the Milwaukee Patent Law Association.

Ralph H. Earle

His 34 U. S. patents cover the years 1926 through 1958, with two patents pending. In addition, 18 Canadian patents were issued during the period. Remunerative patents are represented by total sales of $100 to $200 million.

The creation of a new section within Arkansas Power & Light Company's Corporate Services Department in Pine Bluff, and the promotion of a long-time employee to manage it, were announced recently by **W. M. Murphey,** director of the department.

Benjamin F. Smith, an AP&L employee since 1926, has been chosen by Mr. Murphey to manage the new insurance and property taxes section.

Mr. Smith's responsibilities will in-

clude the developing and administering of a comprehensive insurance program for all phases of the company's business, except those plans which are administered by the personnel department. In addition, he will be responsible for handling the power company's real and personal property taxes.

BullDog Electric Products Division of I-T-E Circuit Breaker Company has announced two new promotions.

Hugh V. Diamond, Jr., has been made production manager of residential equipment, and **Richard R. Frede** has been made product promotion manager of fusible equipment, according to **Merle Spurrell,** director of sales.

Mr. Diamond, a graduate of Lawrence Institute of Technology in electrical engineering, joined BullDog in 1951. Mr. Frede is an electrical engineering graduate of the University of Detroit. Previously with the realty division of General Motors, he supervised the construction of the GM Tech Center in Warren, Mich., and the Fisher Body plant in Grand Blanc.

Both men will make their headquarters in Detroit and report directly to **H. P. Hammelef,** section sales manager.

Harold Jackson has been assigned to the Greenville, S. C., territory of Mill-Power Supply Co., as assistant to **R. F. Smathers,** according to **B. Merritt,** vice-president.

He started with Mill-Power five years ago as a trainee in the shipping department.

Stephen P. Becker, president of Fargo Manufacturing Co., Inc., Poughkeepsie, N. Y., has announced the appointment of **Scott R. Wheaton** as vice-president of marketing.

Mr. Wheaton has been with Fargo since his graduation from Duke University in 1951. He also attended the Graduate School of Arts and Sciences at Duke.

Most recently he has served as sales manager of the company.

Scott R. Wheaton

Chuck O'Connor

Elliott Electric Manufacturing Corp., New York, N. Y., announces the appointment of **Chuck O'Connor** as vice-president in charge of sales and marketing. Mr. O'Connor was formerly sales manager of the Tomic Sales and Engineering Co., Detroit.

Ben Koenigsberg, president of Elliott, made the announcement.

The appointment of **John N. Daniel** as division manager of Square D Company's newly established Commercial Control Div., Asheville, N. C., was announced by **Lawrence G. Maechtlen,** president.

Mr. Daniel, who joined Square D in 1947, has been assigned to Seattle for the past five years, as district sales manager for 1½ years and as Pacific Northwest region manager since 1957.

He was educated in Los Angeles and at Iowa State College, where he received a degree in electrical engineering. He is first vice-president of the Puget Sound Electric League.

Joseph R. Ray has been appointed vice-president in charge of sales of Curtis AllBrite Lighting, Inc., Chicago, Ill. He formerly was general sales manager.

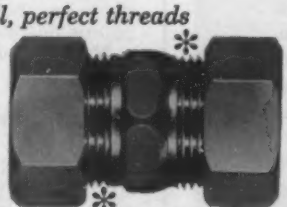
Motorola Communications & Electronics, Inc., has announced the appointment of four new regional sales managers and the establishment of three new urban offices.

Southern appointees are **Ira Walker,** in Memphis, and **Paul E. Russum,** in Motorola's Southern area headquarters in Dallas.

Denver, Indianapolis, and Memphis are new home cities for the Motorola sales organization. Each of the new appointees supervises the sale of two-way radio and other communications products in multi-state areas. Creation of the new regions is part of a nationwide Motorola expansion program to extend sales and service facilities for better customer service.

COMPARE *

Blackhawk's full, perfect threads



with any other fittings on the market

See for yourself that Blackhawk EMT fittings have full, true, perfect threads for ease and speed of installation. Bodies of heavy steel or malleable iron — cadmium and zinc finished to eliminate corrosion on the unit itself. Blackhawk's new EMT fittings are rain tight. Quality controlled at every phase of the manufacturing. Available in complete range of sizes.

Find out why these small, easy to use fittings are best for any electrical job, large or small.

SEND THIS COUPON TODAY

COMPARE BLACKHAWK'S FULL PERFECT THREADS
SEND FOR YOUR FREE SAMPLE
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Please send my free sample of Blackhawk fittings.
Name
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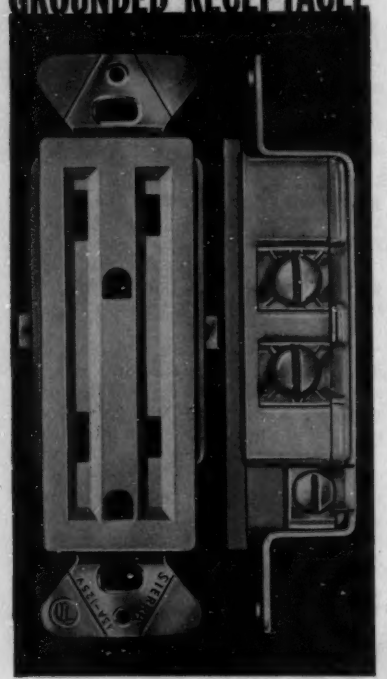
Blackhawk Industries, Dubuque, Iowa
Where the new ideas come from

For more details on above items, use reply card on page 27

NEW
SIERRA
BIPLEX
GROUNDED RECEPTACLE



PAT. PEND.

Biplex is the name for this handsome new duplex receptacle that adds a touch of elegance to your projects —at budget prices! This grounded duplex matches the 2-wire Sierra Triplex and fits the same plates. Biplex is UL approved and meets all codes and standards.

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BIPLEX

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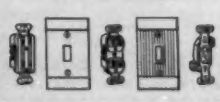
BOX 85, GARDENA, CALIFORNIA
Write for more information and catalog



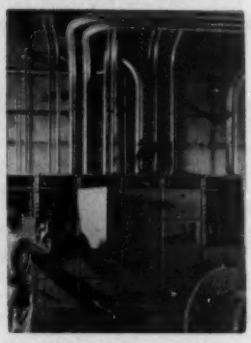
New products

Kaiser aluminum conduit

An improved aluminum electrical conduit which greatly reduces wire pulling effort has been announced by Kaiser Aluminum & Chemical Sales, Inc., 300 Lakeside Dr., Oakland 12, Calif.

The product, called "Kingfisher" rigid aluminum conduit, features an interior coating with a high silicone content.

The new lubricant reduces the pulling force as much as 75 per cent over uncoated metal conduit. The silicone coating, K-40, consistently



reduces the pulling effort to a substantially greater degree than almost any other standard coating regardless of the amount of paraffin on the cable.

In addition, the coating lessens the strain on the conductors during the pulling operation.

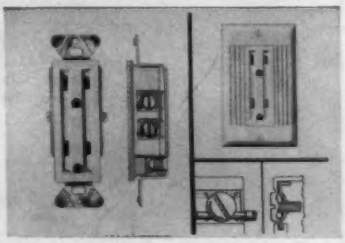
Write P-416 on reply card, pg. 27

Sierra duplex receptacle

One of the newest ideas in three-wire electrical outlets is "Biplex"—a stylish, yet inexpensive "U" ground duplex receptacle manufactured by Sierra Electric Corp., P. O. Box 85, Gardena, Calif.

Biplex is fully UL listed and meets all applicable codes and standards for 15-amp 125-volt devices.

Its distinctive and patented rectangular design complements the Sierra Triplex receptacle; and because Biplex is the same shape and size as Triplex, it fits the same wall plates.



This results in an additional saving since electrical contractors need stock only one wall plate for both receptacles. Also of interest is the laborsaving Tite-Bite terminal feature which incorporates the speed of back wiring with the visually positive inspection of side wiring.

Alternately angled teeth on the terminal and a specially undercut head on the "staked" binder screw form a vise-like grip around the conductor wire, thus making "loop" wiring unnecessary.

Other features include full double-wipe contacts, which are made of heavy - duty bronze; convenient break-off strip for two-circuit wiring; "captured" mounting screws with special header point for fast installation; and green hexagonal grounding screw.

Write P-417 on reply card, pg. 27

I-T-E molded case breakers

Substantial cost and space savings are provided by new 100-amp two- and three-pole molded case circuit breakers—among the smallest ever available for use as main breakers—recently introduced by I-T-E Circuit Breaker Co., 1900 Hamilton St., Philadelphia 30, Pa.

Designated EQ-P (for plug-in con-

nection) and EQ-B (for bolt-in connection), the new breakers can replace much larger E-frame breakers which formerly were needed when 100-amp ratings were required in residential, commercial, and light industrial applications.

Only 2⅞ inches high and two inches (two poles) or three inches (three poles) wide, these breakers reduce mounting space requirements by as much as two-thirds.

Easier to operate, the EQ-P and EQ-B two- and three-pole breakers incorporate expanded handles which run the full width of the breaker.

Write P-418 on reply card, pg. 27

Wiegand counterflow heaters

Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., has announced that its Chromalox sales representatives in 36 major cities across the country will market the line of electric counterflow heating units manufactured and formerly sold by Electrend Products Corp., St. Joseph, Mich.

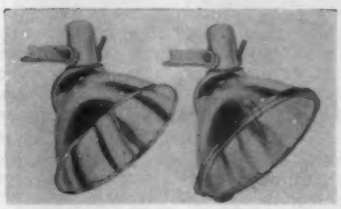
The heaters, which will retain the Electrend name, are designed and built for complete home or supplemental heating, in the remodeling and new home market. They are also adaptable for many commercial types of comfort heating applications, such as motels, churches, etc.

The units have a slender galvanized vertical duct with a quiet air intake impeller at the top and a heating element and warm air delivery outlet at the bottom, utilizing the patented counterflow principle. Both recessed and surface-mounted models are available.

Write P-419 on reply card, pg. 27

Appleton Intenso floodlights

Increased lumen output, greater installation flexibility, and easy maintenance are some of the features of the Intenso Econoflood floodlight



series now available from Appleton Electric Co., 1701-1759 Wellington Ave., Chicago 13, Ill.

A self-centering inner reflector produces extra light to augment the front reflector, giving more light output for energy spent.

Interchangeable mounting accessories attach to the specially constructed steel trunion to speed up installation. Weatherproof construction is featured throughout and a 180-degree vertical swivel permits relamping from front or rear of unit, with no additional tools.

Five Econoflood beam spread models are designed to meet most application requirements from plant security to high level illumination for sports areas, railroad yards, billboards, shopping centers, etc.

Write P-420 on reply card, pg. 27

G-E quieter ballasts

The 40-watt, rapid-start fluorescent lamp ballasts made by General Electric Co., 1 River Rd., Schenectady 5, N. Y., are now "A" sound rated, compared to a previous "B" rating, according to the company's Ballast Dept., Danville, Ill.

Designed for operating single or two-lamp combinations, both 120 and 277 volts, the new ballasts are suitable for use with fluorescent lighting installations in libraries, offices, churches, broadcast studios, hospitals, and other areas requiring exceptional quiet.

The former, relatively quiet, "B" sound rating was the best possible sound level available considering the physical characteristics of the core and coil assembly, the engineers said. The new line of inherently quieter ballasts is the result of design change of the core and coil assembly.

Write P-421 on reply card, pg. 27

Ideal crimp connector

A new larger size crimp connector designed to handle larger wires and combinations has been announced by Ideal Industries, Inc., 1644 Park Ave., Sycamore, Ill.

This is one of the first crimp connectors to be listed by Underwriters' Laboratories for combinations from one No. 14 with one No. 16, up to one No. 6 with two No. 8; a total of 1,028 listed stranded and/or solid wire joints.

It is listed by UL and CSA for general use (600 volts) in branch circuit and fixture wiring up to 75 C; 1,000 volts when enclosed in signs or fixtures.

The crimp sleeve is cadmium plated steel for maximum holding power and protection against puncturing. When the sleeve is crimped, double indents make contact at right angles to the wire so the sleeve cannot slide or twist. No special crimping tool is needed.

After the sleeve is crimped, the "diaper-warp" insulator is applied. This completely insulates all around the joint and between wires.

Write P-422 on reply card, pg. 27

Rolling service ladder

A new Alco-Lite rolling service ladder now being produced by Aluminum Ladder Co., Special Ladder Dept., 23 W. Darlington Street Ext., Florence, S. C., is a completely self-supporting extension ladder unit and requires no secondary support.

An Alco-Lite extension ladder is

mounted on a rigid, welded steel frame that is equipped with eight-inch semi-pneumatic wheels and hand-retractable, swivel type front casters. The large rear wheels move freely over rough floors and allow the unit to be guided easily.

With the ladder in a horizontal position, the over-all dimensions of the entire unit are a compact 30 by 70 inches — allowing the unit to be moved through standard doorways and narrow aisles.

A cam operated device locks steel rods into the bottom gusset-plate rung openings to hold the ladder securely in the upright position. Outriggers, which fold out of the way when not in use, extend to both sides to provide added side stability when needed.

Hand rails and a lineman's plastic belt attached to the top of the ladder are added safety features.

Write P-423 on reply card, pg. 27

Westinghouse fused switch

Developed to protect 2,400- to 13,800-volt distribution circuits at moderate cost, new type DFS drawout fused, metal-enclosed switchgear is now available from Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

It is intended for commercial, institutional, light industrial, and other applications which require compact,

reliable protective equipment but do not require the use of circuit breakers.

Catalogued as load-interrupter switchgear, it is built around a drawout design in which the switch-and-fuse element is withdrawn from the enclosure whenever fuses are to be replaced or switch contacts inspected.

The equipment can be furnished for indoor or outdoor service, either as single-circuit units or as multi-circuit switching centers for service entrances and transformer primary or secondary switching.

It is available in two voltage classes—five and 15 kilovolts—and in two ratings of switches—600 and 1,200 amperes, continuous.

Switches are designed to interrupt

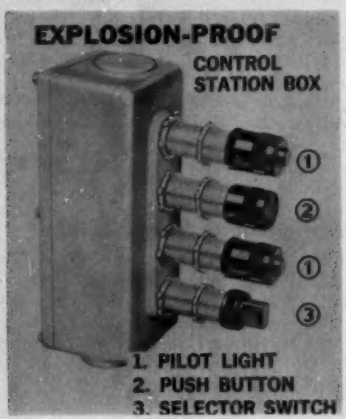
load currents equal to their continuous current ratings for at least 20 times.

Write P-424 on reply card, pg. 27

Adalet flush panel controls

A line of compact, cast aluminum explosion-proof control station boxes, switches, and pilot lights complete with device legend plates for flush panel mounting is announced by the Adalet Manufacturing Co., 14300 Lorain Ave., Cleveland 11, Ohio.

The boxes in single or up to four station sizes can be provided with



combinations of push buttons, pilot lights, and selector switches.

Compactness of the pilot lights and switches is emphasized by the fact that they are located on 1¾-inch centers and require only a 1⅛-inch panel mounting hole.

Selector switches and push buttons are supplied with explosion-proof operators. Push buttons are rated for standard duty with three optional single pole contact arrangement—NO, NC, and NO or NC. Selector switches are available with two or three position contacts.

Made with sealed construction, the pilot lights do not require an external seal.

Four sizes of type "XB" boxes provide for one, two, three, and four stations for combinations of pilot lights, push buttons, and selector switches.

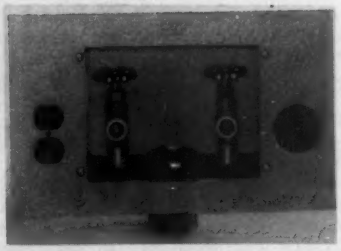
Write P-425 on reply card, pg. 27

Guy Gray supply, drain

Patents on a washing machine supply and drain, complete with a duplex electric grounding receptacle and dryer outlet, have recently been granted to the Guy Gray Manufacturing Co., Inc., P. O. Box 392, Paducah, Ky.

The fixture, which is designed for both commercial and residential installations, is approved by the Western Plumbing Officials Assn., and is listed by Underwriters' Laboratories.

Model No. BED-150 is designed for 1½-inch drain pipe, while model No. BED-200 fits two-inch drain pipe.



Also available are models BE-150 and BE-200, which are supplied without the dryer outlet.

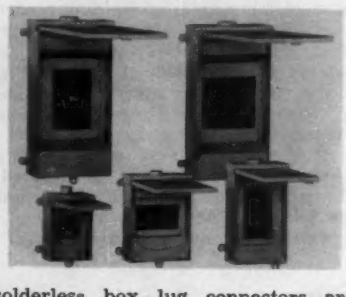
The units are recessed into the wall to eliminate exposed piping and to enable the washing machine to fit against the wall, flush with other appliances. The units are designed for faster handling and installation, as well as lower costs than would be necessary for assembling the piping and valves on the job.

Write P-426 on reply card, pg. 27

Hoffman pullout panels

A complete line of weatherproof fusible pullout panels is now offered by Hoffman Engineering Corp., 9th and Tyler, Anoka, Minn.

The hinged cover enclosures are made of galvanized steel finished with gray hammertone enamel. Attached mounting feet provide installation convenience, and timesaving



solderless box lug connectors are suitable for aluminum or copper wire.

All units have a welded hub on top, ample concentric knockouts in the bottom, and provisions for padlocking. They are suitable for 125/250-volt single phase service with generous wiring room and grounded neutral.

Model 600A contains one 60-amp pullout and partner model 660A has two 60-amp pullouts wired in parallel. Both can be converted to 30-amp service through use of fuse reducers. Model 100A has a single 100-amp pullout, while two 100-amp units wired in parallel are mounted in model 110A. Model 200A carries a husky 200-amp pullout. All are dead-front construction.

Write P-427 on reply card, pg. 27

Duplex polarized receptacle

The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn., announces the availability of a new 20-amp, 125-volt duplex polarized grounding receptacle with riveted grounding contacts and terminals.

This new two-pole, three-wire type grounding receptacle meets the requirements of the latest revisions of the National Electrical Code. Ideally suited for commercial and industrial applications, configuration of the receptacle face prevents insertion of parallel blade plugs.

This makes it impossible to plug ordinary portable electrical equipment, or such appliances as coffee makers, into 20-amp circuits where this receptacle is used.

The receptacle's U-shaped double

grounding contacts and terminals feature a unique one-piece construction of heavy 1/32-inch thick bronze. This is mounted on the strap by a brass rivet, headed on both sides. This rigid one-piece construction eliminates the possibility of loose joints and of parts turning in the grounding path, assuring positive protection for the operator.

Write P-428 on reply card, pg. 27

Metals for Industry solder

A new type of solder, Tin-A-Lum, is now on the market from Metals for Industry, Inc., 299 Pavonia Ave., Jersey City 2, N. J.

The new product is distinct from most other known solders because of the diversity of uses to which it can be put with a soldering iron or a light flame.

It requires no flux or aluminum and its alloys, duralumin, pewter, tin, and magnesium castings. It can be used equally well on copper, brass, ferrous metals, and castings with the aid of normally applied flux.

Joints made with Tin-A-Lum resist up to 12 tons psi. The solder is normally applied at about 210 C, thus allowing use of an ordinary soldering iron. Adhesion to other metals is strong, owing to its good penetration through the surface layers. Corrosion of metal protected by Tin-A-Lum is considerably less than that of the parent metal.

In addition, the solder can be rolled, pressed, or molded into almost any shape, and can be successfully drawn, extruded, etc. Also, it

is a good conductor of both heat and electricity. It can also take a high polish and can be chromium plated.

Write P-429 on reply card, pg. 27

Stonco prismatic luminaire

A new decorative prismatic luminaire recently announced by Stonco Electric Products Co., 333 Monroe Ave., Kenilworth, N. J., is especially effective for all residential, commercial, and industrial exteriors requiring clean architectural styling in a "light-engineered" fixture.

The scientifically-designed globe directs most of its output downward to illuminate the vital activity area beneath entrances, carports, doorways, and other locations where high levels of glare-free lighting are needed. A separate wide-spread pattern of light is projected out to softly blanket walks, porches, platforms, and other surrounding areas.

This desirable down-and-out distribution is maintained with 100-, 150-, or 200-watt lamps by an adjustable socket that insures identical filament location regardless of lamp size.

For maximum efficiency, fixtures are equipped with two reflectors. In-

side, a specular aluminum reflector redirects trapped light. Outside, a mirror-bright weatherproof reflector deflects backlight, usually wasted on building walls.

Write P-430 on reply card, pg. 27

American-Standard heaters

American Standard, 40 W. 40th St., New York 18, N. Y., announces their new Electri-Warm deluxe line of baseboard heaters, series No. 220 through 223. These are made available in various sizes ranging from 840 watts (three-foot lengths) to 2,840 watts (nine-foot lengths) and are six inches high.

The heating element is of the "Rad" type, welded to continuous radiant fins and mounted on floating holders that permit soundless expansion and contraction. Internal

front and rear baffles insure rapid heat dissipation and constant temperature control.

Standard and deluxe selections on line and low voltage controls are also available.

American-Standard is also introducing companion lines of "standard" and "economy" baseboard in order to make available a complete line of baseboard for every application.

Write P-431 on reply card, pg. 27

Nelson motor control center

A new motor control center, designed especially for use with automation systems, has been introduced by Nelson Electric Manufacturing Co., P. O. Box 5385, Tulsa, Okla.

Swing out starters and circuit breakers on the new motors utilize permanent wiring for both load and control. Separable terminals eliminate the necessity of disconnecting wiring when a unit is removed. All wiring for load, control, and indication is brought to easily accessible master terminal blocks at top or bottom. Interwiring is done at the factory.

Each starter unit is equipped with fused control transformer, two extra interlocks, and one special microswitch. Combination non-reversing starters through size four and circuit breakers through 225-ampere size utilize the new construction. In addition, all bus is arranged edge to edge to provide better bracing against short circuit stresses.

Write P-432 on reply card, pg. 27

Eagle ground devices

Designed to provide full compliance with Code revisions, a new heavy duty 20-ampere U-ground duplex receptacle and a new heavy duty 20-ampere ground armored cap have been introduced by Eagle Electric Manufacturing Co., Inc., 23-10 Bridge Plaza S., Long Island City, N. Y.

Rated at 20-amperes, 125-volts, both ground devices extend safety grounding to many additional indus-

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WIREHOLDERS
The No. 5009 has been designed to satisfy the most critical requirements — metal parts in tension and porcelain in compression. All steel parts are HOT-DIP GALVANIZED. The Porcelain has been designed with well-rounded edges and provides a larger, pulley-action wire hole. The spun solid copper rivet interlocks the Insulator with the metal portion of the Wireholder. Extra sharp screw thread for easy starting and full threaded. The heavy screw-shank base offers high resistance to side pull. KNOX No. 5009 Wireholders far surpass recommended ratings on standard house service conductors. This Wireholder can also be supplied with 22 x 3" and 22 x 4" Screws.
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For more details on above items, use reply card on page 27

trial, commercial, and home installations, including heavy duty portable tools; business machines; clothes washers; dish washers; and cellar, garage, and open dock installations.

This new Eagle 20-amp ground receptacle, cat. No. 877, will also accommodate regular two-wire caps and grounded three-wire caps—comprising one outlet for all. Designed for fast snub wiring, this new No. 877 offers a wire hole that eliminates the need of a loop around the screw.

The No. 809 20-ampere ground armored cap, with cord clamps, has parallel, tandem, and U-ground prongs arranged to conform with the new Code revisions for 20 amperes. Its diameter permits two caps to fit the No. 877 receptacle.

Write P-433 on reply card, pg. 27

Slater variable dimmer

Slater Electric and Manufacturing Co., Inc., 45 Sea Cliff Ave., Glen Cove, L. I. N.Y., announces the Hi-Lux, a new miniaturized electronic variable dimmer.

The Hi-Lux is a completely new approach to incandescent lighting

control. It uses no rheostats and requires no transformers.

The miniaturization of the design permits the electrical contractor to install the device in an ordinary outlet box requiring no additional wiring. The amount of current consumed is approximately proportioned to the amount of current required. The heat dissipated by the device is negligible, particularly when compared to an auto transformer or a resistor type dimmer.

The Hi-Lux rotary dimmer is available in three 600-watt models.

Write P-434 on reply card, pg. 27

A-S zonal heater series

The introduction of the "Electri-warm" series of heaters by American-Standard, 40 W. 40th St., New York 18, N. Y., marks that company's first entry into the zonal heating field.

One unit in this series, No. 120, a fan-forced, non-glowing heater, is a built-in wall unit of 1,500 watts. An automatic thermostat controls the room temperature at pre-set degrees. However, the frame remains cool, with no danger to paint or tile. Nichrome elements are used in the heater.

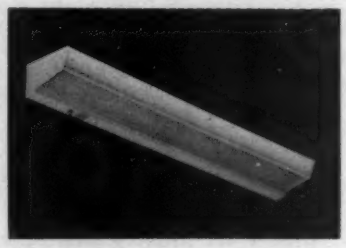
Dimensions of the rough-in are height, 17⅛ inches; width, 10⅛ inches; and depth 3⅝ inches. Four clamps on the unit eliminate need for nails or screws.

The heater is listed by Underwriters' Laboratories.

Write P-435 on reply card, pg. 27

Day-Brite hospital light

A new fluorescent hospital bed light, featuring both downlight for reading or patient examination and uplight for soft general room illumination, has been announced by Day-



Brite Lighting, Inc., 6260 N. Broadway, St. Louis, Mo.

The lights are available in two- or four-foot models. Finishes include stainless steel or baked white enamel. Lighting surfaces are shielded with Cleartex prismatic plastic panels.

The fixture is equipped with either single lamp trigger-start ballasts in the two-foot model or two single lamp rapid-start ballasts in the four-foot model. These are controlled by a two-circuit switch. The unit can be used for downlighting only, uplighting only, or both. The switch is on the bottom of the wall mounted unit within easy reach of patient or hospital personnel.

Write P-436 on reply card, pg. 27

Slater grounding receptacle

Slater Electric and Manufacturing Co., Inc., 45 Sea Cliff Ave., Glen Cove, L. I., N. Y., has a new duplex Speed Wire grounding receptacle.

This timesaving screwless grounding receptacle has several new features to speed up installation. It has a two-circuit break off feature, and also has speed wire rear wiring, double wipe contacts, patented side release, and washer type plaster ears.

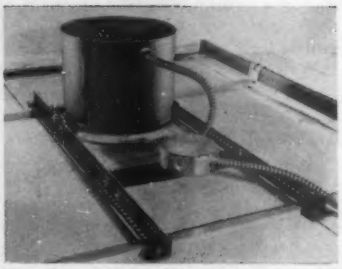
The self tapping mounting screws are captive in bracket and there is provision for an extra ground screw. The No. 880-BR is brown and 880-IV is ivory.

Write P-437 on reply card, pg. 27

Versen suspension system

A new system for hung ceilings which transfers all lighting fixture weight to support members has been developed by the Kurt Versen Co., 4 Slocum Ave., Englewood, N. J.

No weight is on the tiles with this factory engineered method, which eliminates improvising on the job, drastically reduces installation time,



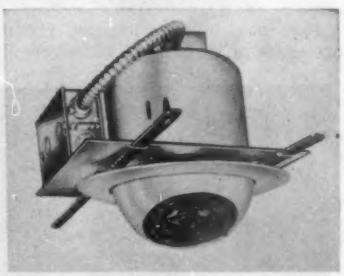
and cuts costs. It is suitable for recessed or surface-mounted equipment, and adapts to all types of acoustical tile and ceiling panels.

Complete packages of fixture and accessories are supplied by the manufacturer. Recessed models without ceiling flanges are available for neat appearances.

Write P-438 on reply card, pg. 27

Halo louvered eyeball unit

Halo Lighting Products, Inc., 4201 W. Grand Ave., Chicago 51, Ill., manufacturer of recessed lighting fix-



tures, is introducing a new 75-watt, R30 louvered eyeball unit. The eyeball itself, No. 408, rotates 358 degrees and has a 42-degree vertical adjustment.

Halo's standard H7 prewired or H147 unwired housing may be used with the smart looking louvered eyeball. Trim finishes available are satin chrome, satin brass, satin copper, and eggshell paint.

Write P-439 on reply card, pg. 27

Mitchell motif luminaire

Mitchell Lighting Div., Compco Corp., 1800 N. Spaulding Ave., Chicago 47, Ill., is manufacturing a new Motif wraparound luminaire which is fully enclosed and shielded by an especially developed refractor-diffusor lens.

The luminaire is very shallow with an apparent depth of 2⅛ inches when viewed from the side. The refractor-diffusor lens is designed to distribute 88 per cent of the light to the working plane and 12 per cent to the side walls and ceiling.

It is made of color stabilized polystyrene. From normal viewing angles the fixture has a low brightness resulting in a comfortable seeing condition.

Write P-440 on reply card, pg. 27

Technical books

for the electrical man

A-c circuit theories

"Alternating - Current Circuits," Fourth Edition, by Russell M. Kerchner, head, EE Dept., Kansas State U., and George F. Corcoran, chairman, EE Dept., University of Maryland. Published by John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y., 602 pages, illustrated, $8.75.

Although this fourth edition of the book contains the same logical, carefully graded presentation of a-c circuit data, it has been extensively revised and thoroughly modernized.

Among new topics now included in the book are the basic concepts and terminology of network topology; examples of network solutions employing loop equations, nodal equations, node pairs, and superposition; the pole-zero method of circuit analysis; the concept of complex frequency and its use in the explanation and understanding of elementary transient phenomena; and the principle of duality and its application to the comparison of different types of circuits with analogous characteristics.

Major subjects still contained in the book include network concepts; instantaneous current, voltage, and power; effective current and voltage-average power; phasor algebra; sinusoidal single-phase circuit analysis; non-sinusoidal waves, coupled circuits; transmission line calculations; electric wave filters; symmetrical components; power system short-circuit calculations; transient conditions; and balanced and unbalanced polyphase circuits.

Nondestructive tests

"Nondestructive Testing," by Warren J. McGonnagle, Associate Physicist, Argonne National Laboratory. Published by McGraw-Hill Book Co., Inc., 327 W. 41st St., New York 36, N. Y., 457 pages, 413 illustrations, 65 tables, $15.00.

The physical principles, techniques, advantages, and limitations of the various methods of nondestructive testing are covered comprehensively in this newly-published volume.

Based on applied physics, the treatment in the book stresses nondestructive testing as a science, and outlines the what, why, how, when, and where of this rapidly-developing technology. The author points out that this type of testing is concerned not only with the detection and location of flaws in material, but that its methods and techniques measure physical properties or nonuniformities in the physical properties of specific materials.

Physical principles which underlie a particular test method form the basis for each of the book's chapters, and special techniques for solving a variety of practical problems are included. Among the major testing procedures treated in detail in this integrated volume are visual testing, pressure and leak testing, liquid penetrant inspection, thermal methods, X-ray and gamma radiography, ultrasonics, dynamic testing, magnetic and electric techniques, and eddy current methods.

Nondestructive test work in the growing field of atomic energy is emphasized.

Radio-TV interference

"Eliminating Man-Made Interference," by Jack Darr. Published by the Howard W. Sams and Co., Inc., 1720 E. 38th St., Indianapolis 6, Ind., 160 pages, 173 illustrations, $2.95.

This is a long-awaited, practical book on noise and interference problems, which are among the most perplexing facing service technicians.

Twelve chapters cover the entire field of man-made interference — what it is, how it is transmitted, how it originates, how to track it to a source, and how to eliminate or minimize its effects in home radios and TV, audio amplifiers, two-way mobile-radio systems, auto, aircraft, and marine radios, electromechanical apparatus, geophysical equipment, etc.

Two whole chapters contain actual case histories of many types of interference, as well as many out-of-the-ordinary types of noise and interference from the files of the FCC.

Among the illustrations are actual photographs of many types of interference as they appear on TV screens. Other illustrations show how to build a noise filter, and how to eliminate noise from small a-c motors.

Electric fundamentals

"Electricity and Electronics-Basic," by William B. Steinberg and Walter B. Ford. Published by the American Technical Society, 848 E. 58th St., Chicago 37, Ill., 262 pages, numerous illustrations and photos, $4.50.

One of the American Technical Society's most popular texts, this book has been adopted by many

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schools in the few years since it was first issued.

This revised, second edition is a refinement of the original text, and has been designed to keep pace with the latest electronic developments as well as to make the instructional method even more effective.

Among its features are discussions of the electron flow theory of electricity, new material on transistor fundamentals and on silicon rectifiers, and the addition of new projects in various areas.

Major units covered in the book include an introduction into the scope of electricity, making use of magnetism, how electricity is produced, basic electrical circuits, electricity for everyday living, using electricity for communication, basic electrical formulas, standard symbols for electronics, and soldering hints.

In addition, a complete section of supplementary projects utilizing principles taught in the book is included.

Television servicing

"Most-Often-Needed 1960 Television Servicing Information," compiled by M. N. Beitman. Published by Supreme Publications, 1760 Balsam Rd., Highland Park, Ill., $3.00.

The manual covers all important TV sets of every make, according to the publisher.

Factory service material simplifies repair jobs. Included is practical advice on how to find each fault and make needed repairs.

Semiconductor circuits

"Selected Semiconductor Circuits Handbook," edited by Seymour Schwartz, president, Transistor Applications, Inc. Published by John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y., 506 pages, illustrated, $12.00.

This book provides the background necessary for original work in circuit design.

It offers an accurate and convenient reference to more than 150 semiconductor circuits, together with a discussion of the general theory from which they were developed. The circuits, which were selected on the basis of inventiveness and reliability, represent some of the most advanced engineering techniques.

They cover a wide range of subject matter, encompassing such topics as direct-coupled, low-frequency, and high-frequency amplifiers; oscillators; switching circuits; logic circuits; a-c to d-c power supplies and d-c to d-c converters; small nonlinear circuits; and transistorized magnetic circuits.

The design philosophies are presented in a practical and informative manner at the beginning of each chapter preceding each group of selected circuits.

Helpful literature

available to our readers

Catalog B-960, newly released literature on **switch and outlet boxes,** is now available from the **Electrical Fittings Corp.,** 37-50 57th St., Woodside 77, N. Y. Illustrated throughout, the catalog gives specifications for switch and receptacle boxes, octagon and square boxes, concrete box rings, hung ceiling boxes and bars, rigid gang boxes, utility boxes, shallow ceiling boxes, hanger bar and box assemblies, covers, extension rings, and specialty items. Also newly available from the company is catalog F-960, covering their new line of electrical fittings.

Write B-441 on reply card, pg. 27

GEA-7313, a newly released four-page publication, lists features and advantages of the full line of totally weatherproof **fluorescent lamp ballasts** made by **General Electric Co.,** 1 River Rd., Schenectady 5, N. Y. The illustrated bulletin discusses typical ballast applications and contains a table of weatherproof ballast list prices and data.

Write B-442 on reply card, pg. 27

Specifications and illustrations of **grounding equipment and connectors** are included in a newly released catalog from **Harold L. Boggs and Co.,** 34 N. Gore Ave., St. Louis 19, Mo. The catalog covers ground rods and clamps, as well as various forms of cable spacers and connectors.

Write B-443 on reply card, pg. 27

The **Edwin F. Guth Co.,** 2615 Washington Ave., St. Louis 77, Mo., has published an eight page brochure on its new two- by four-foot module Gratelite **luminous ceilings.** The booklet contains photographs of existing applications of Gratelite as well as technical data.

Write B-444 on reply card, pg. 27

Construction and design features which contribute to the reliability of intermediate outdoor **oil circuit breakers** (type FZO) made by **Allis-Chalmers Manufacturing Co.,** 938 S. 70th St., Milwaukee 1, Wis., are described in a new bulletin released by the company. The bulletin tells how tank lowering and raising time and labor are cut 80 per cent over manual-operated methods by means of a portable hydraulic lifter.

Write B-445 on reply card, pg. 27

A 12-page, illustrated booklet containing complete engineering data on their surface wiring **raceway systems** is available without charge from the **Wiremold Co.,** Hartford 10, Conn. The folder covers Wiremold series 200, 500, 700, and 1000, including a complete description of fittings available for each series. Special sections deal with specifications of the raceway, wire capacities, installation instructions, and available tools.

Write B-446 on reply card, pg. 27

A revised and expanded edition of the Powerdyne catalog, section 1, has been issued by **Powerdyne, Inc.,** 17150 S. W. Boones Ferry Rd., Oswego, Ore. It contains illustrations and descriptions of the company's line of **pole top switches,** 400, 600, and 1,200 amperes, 7.5 kv through 69 kv.

Write B-447 on reply card, pg. 27

Feedrail Corp., 125 Barclay St., New York 7, N. Y., has issued a 32-page bulletin (No. 80) cataloging their heavy duty trolley busway electrical **distribution systems.** The bulletin illustrates and describes the 225-, 375-, and 500-ampere systems for electrification of heavy duty cranes and hoists, machine tools, conveyor assembly lines, or other moving equipment that must be powered.

Write B-448 on reply card, pg. 27

Ohio Brass Co., 380 N. Main St., Mansfield, Ohio, has issued a new folder listing its **condenser bushings** from 15 kv through 196 kv. Included are transformer and circuit breaker bushings of two general types: class LK with resin-paper core and class GK with oil-impregnated paper core. O-B bushings fulfill all classifications in ASA standard C76.1a-1958 as indicated.

Write B-449 on reply card, pg. 27

Know the law

(Continued from page 106)

cannot enforce the provisions thereof by 'criminal sanctions', but is restricted to recovering the amounts thereof in a civil action. Section 11.00 of defendant city's Municipal Code provides, among other things, that a violation of its terms may be prosecuted and punished as a misdemeanor.

"We are not in accord with appellant's contention that such prosecution and subsequent possible imprisonment for failure to pay the business license tax is a violation of Section 15, Art. I of our State Constitution in that it constitutes imprisonment for debt. . . .

"In re Diehl, 8 Cal. App. 51, 55, 96 P. 98, 100, we find the following pertinent language: 'The misdemeanor consists in a refusal to obey the provisions of the ordinance, and the fine authorized to be imposed upon conviction is not intended as a payment of the license tax, but as a punishment for defying the commands of the ordinance.'

"To us there appears to be no inherent difference between carrying on the business of a state-licensed electrical contractor and carrying on any other business pursuit.

"The levy and collection of taxes by a city having a charter under our Constitution is a municipal affair. The power is broad, being limited only by the charter and the Constitution . . . . It cannot therefore, be said that the State Contractors Licensing Act in any way limits or restricts the constitutional and charter rights of defendant city to collect a business license tax for revenue purposes. . .

"We perceive no invasion upon the general law, which is the only 'regulation' authorized for state licensed contractors by a prosecution for failure to pay a business license tax, as no such invasion would be present in a prosecution of a state licensed contractor for violation of a municipal ordinance prohibiting the blocking of streets with trucks, barriers or other paraphernalia used in the contracting business, without first obtaining a permit from the municipality so to do, or of a state licensed contractor who established and conducted his business in violation of a municipal ordinance, restricting the area to single family residences.

"And finally, an unbroken line of decisions in this state has consistently sustained the power of municipalities to impose business license taxes for revenue purposes, and making the violation thereof a misdemeanor."

Ground resistance

(Continued from page 94)

The rods, however, are considered as absolutely necessary since it is not desirable to rely on line overhead ground wires to give a low substation resistance. Also, resistance of the cables and counterpoise may change as moisture conditions of the soil change.

Another variation is that at some stations, because of high rod resistance where depth was limited by rock formations, an excessive number of rods were installed in an effort to obtain a satisfactory resistance. This obviously reduced paralleling effectiveness.

Figure 9 also emphasizes the need for more paralleling effectiveness data on different combinations of rods.

The economy of the type of substation grounding system and testing as presented in this paper has not been discussed. The need for engineered economy is recognized in all design work, but the desire to provide a high degree of protection for personnel and equipment justifies the goal of low resistance substation grounds.

The cost of preliminary testing is comparatively small and is usually offset by the economy and reliability gained from the use of deep driven ground rods.

Transformer housings

(Continued from page 87)

the transformer probably should be considered to be derated slightly. Considering the usual case where cyclical loading occurs, we feel a transformer inside the Transclosure housing can be treated the same as a pole-mounted unit for loading purposes.

Question: What will be the effects of dry snow, dust, or moisture condensation in Pad-Mount cabinets and in Transclosure housings on cable terminations, bushings, and switches operating at 7,200 volts or more above ground potential?

Answer: This is somewhat a continuation of a previous question regarding pothead terminations versus indoor terminations and the resultant contamination hazards encountered. In Transclosure housings, the majority of the equipment employed is of the outdoor type.

Switch insulators, transformer bushings, and other insulating materials are suitable for operation outdoors. The critical area again appears to be the cable termination employed, and as stated previously, we have no record of complaint on indoor-type cable terminations in Transclosure housings.

With the venting provided in Transclosure housings, we do not feel that moisture condensation will be one of our problems, and without moisture, dust should not prove to be a great problem either.

We have sold units for installation in Wisconsin, Minnesota, Colorado, and Alaska. These have been subjected to snow conditions and, to date, we have received no complaints due to insulation failure, or any other cause.

I doubt that small quantities of dry snow would have any effect on the insulation materials employed in the Transclosure housings. The snow particles would probably pass through the housing or settle on the equipment within the housing and melt, causing single droplets of water to be formed which would evaporate relatively quickly.

During very heavy snow storms a portion of the vent openings would very likely become temporarily clogged, thus restricting the amount of snow entering the Transclosure housing. The heat from the transformer will gradually melt the snow, partially clogging the vent opening. Therefore, the effective venting of the Transclosure housing will be only temporarily limited and will occur during a time when the ambient temperature is low. Again, the only confirmation of our thinking can be obtained from actual operating experience.

Cable troughs

(Continued from page 85)

effects of this spray. In fact, we feel it may assist in keeping down termite and rodent damage.

A good control cable installation should be expected to last about 20 years and we will require another 14 or 15 years to find out if our installations will stand the test of time.

There have been several classic examples where cable failure due to termites occurred within weeks of its installation. Some telephone companies feel that if their cross country lines last six months or longer, they should last the full 20 years.

We are experiencing some trouble with control cables which have been installed ten years or more. In a number of cases, lead covered cables have failed; and an examination showed the lead completely gone in spots.

Rubber insulated single conductor wires in conduit carrying negative direct current have grounded. However, we have yet to lose the first piece of PVC insulated and jacketed cable.

We certainly do not use the cheapest way of installing control cables, and we have not found the perfect answer to control cable installation.

However, we do have a method that is economical to install, that

is flexible and not easily outgrown, that lends itself to being expanded in any direction, and one that both our installation and operating crews like.

Ideas better job

(Continued from page 56)

that you have good ideas and make him think that he suggests something, it often makes a better wiring job. If you see your suggestion might give a man a better job, go ahead and talk it over with him."

Mr. Ramsey used this philosophy in wiring Gaffney's large Colonial Restaurant. In fact, this philosophy brought him the job in the first place.

The owners operated a small drive-in restaurant before they built the large establishment, and Mr. Ramsey supplied the electrical service and upkeep for this drive-in.

When he first started servicing the drive-in, it had single phase wiring. He talked to the power company and worked out a three-phase system, which the owners found much more satisfactory for their needs.

Mr. Ramsey did not nave to suggest this system — he could have utilized the already existing wiring.

But this and other services paid off when the drive-in owners decided to build a larger facility which would seat 500, have weekly dances, offer drive-in and cafeteria service, and feature a 100 per cent electrically equipped kitchen. Mr. Ramsey obtained the contract with little difficulty, in fact, as restaurant co-owner Doug Reeves stated, "We did not even let bids on the electrical work, because we knew who we wanted to do the job."

Mr. Ramsey contracted to do the job on labor plus materials. He was presented a set of plans before he began, studied them, and before long began making suggestions.

He noticed that conduits were to be used in wiring the all-electric kitchen. In the first place, he didn't think this would look attractive in an expensive, modern installation. Secondly, he believed that eventually grease from the cooking would damage wiring leading to the appliances.

From this Mr. Ramsey made his first suggestion to the restaurant owners, and they liked his idea better than their own. As a result, Mr. Ramsey used troughs enclosed in cabinets to eliminate unsightly conduits sticking from the walls. He bored holes in the cabinets on which the appliances were placed, and dropped the wires through the holes to the outlets on the troughs.

Now the wiring is hidden from view and grease-caused damage.

Mr. Ramsey suggested that the restaurant use a signal system, similar to those used in hospital to call nurses, to call waitresses to the private dining rooms.

As a result, he installed call lights outside of each private dining room and a master panel of lights in the kitchen. If a waitress does not see the light on the outside of the dining room, someone in the kitchen can dispatch assistance to the room.

Because the restaurant was to be used once a week for dancing, Mr. Ramsey suggested that a lighting system be used which could be turned on bright for gala parties and then dimmed for small, intimate affairs.

The owners liked this and several more ideas which were suggested before the job was finished.

"The job actually cost them less than they had expected," said Mr. Ramsey.

"He did a fine job. We liked his suggestions much better than the way we had planned it. And he didn't have to do anything over again. It all worked from the minute he pulled the switch," said Mr. Reeves.

Heavy-up education

(Continued from page 39)

ment house landlords and residents, and small shopkeepers.

Misled by advertising and overeager salesmen, the public buys air-conditioners, washers, dryers, and "plugs them in" as instructed, only to learn that the circuits become overloaded, main fuses are blown, and the household is without lights.

Or a shopkeeper wants illumination modernized, a store air-conditioned, or refrigeration units added, and he cannot realize why this cannot be done on the existing 100-ampere service.

The homeowner calls me in when the lights have suddenly gone out. This situation provides the greatest source of business.

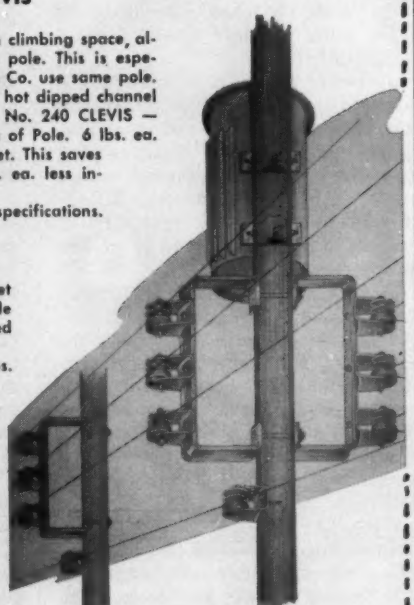
But unfortunately I have to fill in what salesmen didn't say. I

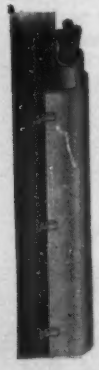
THIEL Secondary Extension Bracket and Insulator Clevis

Moves wire out from Pole to give lineman climbing space, also uses a minimum amount of space on pole. This is especially desired when Power Co. and Phone Co. use same pole. Has 9" wire spacing and only 22" overall hot dipped channel — 2 x 3/16 x 9/16, when used with our No. 240 CLEVIS — center of Porcelain is out 12½" from side of Pole. 6 lbs. ea. Also furnished with Clevis Weld to Bracket. This saves time of bolting out in the field. 13 lbs. ea. less insulators. No. 350.
Extension bracket will be made to your specifications. Mail us your prints for prices.

Secondary Clevis No. 240

For use with Secondary Extension Bracket or Direct Pole mounting 4" center at hole to back of bracket. 3/16" x 3" hot dipped galvanized with or without insulator. Wt. 2¼ lbs. ea., 25 pcs. per case, 61 lbs.





Conduit Guard

For covering Fiber or Transit Conduit or Lead Covered Cable on Terminal Pole. Made of 12 Ga. Steel. Hot Dip Galvanized after Fabrication. Length 9 ft.

Cat No.	Conduit Size	Weight Lbs.
103	3"	36
104	4"	44
105	5"	52½

Sold by Leading Electrical Wholesalers

Thiel Tool & Engineering Co.

1417 NORTH MARKET ST. • ST. LOUIS 6, MO.

have to give the customer a post-sales lesson in electric power that should have preceded, not followed his air-conditioner or appliance purchase. For in almost every case, the customer remarks with genuine bafflement, "The salesman didn't say that. He said all I had to do was 'plug it in'."

I explain that in this old part of town, where old residences and stores found a 30-ampere service sufficient for the simpler living of 25 and 30 years ago, such service is not sufficient for a family's electrical needs today. Many do not understand that 30-ampere limits the amount of available power to that capacity.

I try to simplify the lesson to them by comparing electric power with a gallon bucket of water. If your lights, toaster, electric iron, and electric fan use up your 30-ampere service, that's as far as you can go. If you've got only one gallon of water and distribute it over eight containers of one-pint each, a ninth container cannot be accommodated. More power has to be added to take on an air-conditioner or washing machine.

I have gone into a home where main fuses were blown and discovered an entire bushelbasket full of blown fuses. I have seen a home where a woman tried to plug in a combination washer and dryer and blew the main fuses. My instruction usually comes too late. Still, I tell them to check with the power company if in doubt.

The problems of working in old residences and stores are familiar to most contractors. Lack of space prevents placing panels in the best location. Fittings have to be obtained and space saved by recessing panels into the wall.

For example, an old commercial establishment proprietor insists on using the old type of equipment that is outmoded and difficult to reinstall. We recently had a case where old ceiling fans with four-foot blades on five-foot stems had to be anchored to the roof. We devised a flat iron bar to hold them. Nothing could convince the elderly shopkeeper that greater efficiency could be had with modern fixtures.

A common problem in old homes is bad plaster that is aged and highly brittle, and far more repair work has to be done than called for by the job. Yet customers stipulate that work be carried out without disturbing family routines or normal business.

However, the greatest problem facing contractors, I insist, is educating the public to the meaning of electric service capacity. Thinking that electric power is as available and as unlimited as fresh air, the public is caught between the salesman's easy talk and the contractor's contradictory statement. They are convinced that someone is trying "to take them."

A good public education program in electric power is lacking. There is dire need for one to help all of us.

All-electric school

(Continued from page 45)

tains approximately 8,000 square feet of floor space.

Mr. Gribble realized that teachers of handicapped children have difficult teaching jobs even under the best of conditions. He wanted to be sure that the heating, lighting, and ventilation systems would adequately meet the demands put upon them.

He completed the building last year and turned it over to the city and county school boards. The two school boards now jointly own and maintain the school.

The school is not limited to residents of McMinnville and Warren County, however. In his contract with the two school boards, Mr. Gribble stipulated that mentally or physically handicapped children from surrounding counties may also attend, after the needs of Warren County are met.

Code application

(Continued from page 52)

plosion, are first cooled below the ignition temperature of the surrounding explosive mixtures in the atmosphere before they reach the outside of the enclosure in which the explosion occurred.

This is done by forcing these escaping gases to travel around the threads of a threaded joint or across the wide face of a tight, ground joint before they can reach the outside. In either case, they are cooled to a safe temperature before they reach the surrounding hazardous atmosphere.

Threaded drains and threaded vents are also safe to use by reason of the circuitous route provided by the threads for liquids or gases leaving the enclosure.

It is the passage of the gases across a wide and very snug surface that cools the escaping gases through a ground joint. That is why such an enclosure becomes a hazard if one screw is left out or even if left loose.

It is very important, therefore,

NOW AVAILABLE
IN 4-WAY
FOR EXTRA PROFITS

EAGLE

15 AMPS
120-277 VOLTS AC ONLY
IN BOTH FLUSH
AND INTERCHANGE
TYPES

TOUCH-A-MATIC
QUIET SWITCH

AN E-Z WIRE ® DEVICE

MEETS FED. SPECS. NO. 244B-BROWN
PAT. NO. 2,743,330 NO. 244V-IVORY

*THE SWITCH WITH **ALL** THE ADVANTAGES*

- Sure-tight, enclosed, E-Z WIRE ® Pressure Terminals in rear.
- Just strip and push Wires into Terminals. To release, press down in slot with screwdriver.
- Prevents haphazard connections

- Takes standard wall plates
- Installs in any position

- Feathertouch Instant Action. ROCK IT—PUSH IT — TOUCH IT.

- Packaged in Cellophane-Wrapped Eagle **"SHO-PAK"** ●
- TOUCH-A-MATICS are also available in S.P. and 3-Way; Flush and Interchange types; 15 Amps and 20 Amps, 120-277 Volts AC only. With plaster ears, self-tapping Captive screws.

See us at the NAED CONVENTION, HOTEL STATLER-HILTON, DETROIT, AND MIDWEST ELEC. IND. & LTG. EXPOS., BOOTHS 243-5-7, CHICAGO.

"Perfection is not an Accident"
EAGLE ELECTRIC MFG. CO., INC.
LONG ISLAND CITY 1, NEW YORK

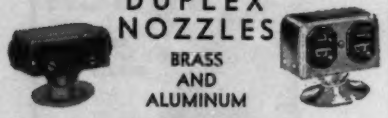
For more details on above items, use reply card on page 27

Latrobe PRODUCTS

★ FLOOR BOXES ★ WIRING SPECIALTIES ★

Short Stem TELEPHONE and DUPLEX NOZZLES

BRASS AND ALUMINUM

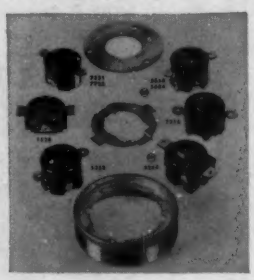


Shorter styled, modern, flanged duplex telephone and receptacle nozzles in satin brushed brass or anodized aluminum. Standards fit ½" opening. ¾" stems available. Also grounded receptacles.

ADJUSTABLE STEEL BOX

This is our #190 series, with a 3¼" brass cover plate. Comes in two standard heights-3½" and 2⅝" minimum. Designed for power or telephone service. A "KEY" (shown in center of photo below) which fits most popular size and style receptacles has been added at no extra cost.

Adjusting ring for our 190 series is so designed that KEY drops easily into special slots. You select the receptacle required and simply "LAY-IN"; then "LAY-ON" receptacle ring. That's it.



CAST IRON ADJUSTABLE BOX

Watertight Floor Box — 3½" or 4¼" brass cover plate with 2" or 2⅜" abandon plug for power or ½". ¾" or 1" for telephone service or duplex receptacle nozzles. Equipped with ground wire.

INSULATOR SUPPORTS

Malleable iron clamps of high tensile strength. Fastens to steel framework without punching holes. Four sizes — 1", 1½", 2" and 2½".

LATROBE PRODUCTS

NON-ADJUSTABLE FLOOR BOXES—ADJUSTABLE FLOOR BOXES—GANG BOXES—COVER PLATES—JUNCTION BOXES—NOZZLES—PIPE OR CONDUIT HANGERS—INSULATION SUPPORT—CABLE SUPPORTS—FISH WIRE STAPLE AND CABLE CLIPS

Write for Complete Catalog

Sold only Thru Wholesalers

FULLMAN MANUFACTURING CO.

LATROBE . . . PENNSYLVANIA

for *all* of the many screws holding a cover on an enclosure which has a ground joint to be screwed up tightly. It is also very important that such joints be kept clean and protected. They should not be scratched or scraped and they should never be cleaned with sand paper or emery cloth.

They should be protected instead from rust and corrosion with a film of petroleum jelly, such as Vasoline, or by a patented preparation approved for the purpose. Threaded joints should be protected also and not scratched deeply across the threads.

Answers to Code test questions: (1. **T** Section 501-2-a-1) (2. **T** Section 501-2-a-2) (3. **F** Section 501-2-b) (4. **T** Section 501-3-b-1) (5. **T** Section 501-3-b-2) (6. **b** Section 501-3-b-3) (7. **c** Section 501-4-a) (8. **a** Section 501-4-b) (9. **a** Section 501-4-a) (10. **c** Section 501-4-b).

Complex lighting

(Continued from page 38)

A 200-amp auxiliary line leads through two-inch steel conduit along the wall to the transformer. A 16-circuit panel box with 20-amp breakers has been installed near the transformer and takes care of ten individual double base outlet boxes near the floor.

From this panel box a ¾-inch conduit leads to a six-circuit box to control lighting for the "white room," as it is termed by Mr. Langley. This three-sided room with white walls has 16 150-watt reflector bulbs mounted on movable fixtures that direct the lights in any direction.

These 150-watt reflector lamps can be doubled in wattage output by stepping up the voltage through the ColorTran regulator. The lamps provide a great amount of illumination through indirect lighting reflected from the white walls on an object being photographed in the center of the room. This method of lighting eliminates shadows on the object.

Future plans call for more overhead lighting in the new studio. Ten large 1,500-watt "scoop" reflector fixtures are to be mounted, plus other increased lighting, to add another 15,000 to 20,000 watts for illumination.

Assembly cuts labor

(Continued from page 40)

a prime factor cherished by the trailer park owner interested in attracting the better trailer park resident.

Mr. Ward finds a saving in labor "of at least 25 per cent" by shop fabricating the number of meter boxes and their pipe supports required to feed the many sites in the parks, some of whose owners either install a master meter so they can re-meter and turn a profit by reselling current to the park's residents, while other park owners prefer direct metering to each site from the utility's service.

In cases where he supplies the exterior lighting for a park, Mr. Ward also prefabricates the low-level lighting standards, in addition to the multi-meter switch boxes. These feed from fabricated sheet metal troughs inside which is placed all the wiring that feeds to the tops of the switches.

Upon completion, the meter assemblies are hauled to the trailer sites where Ward Electric casts the concrete bases to hold their supporting conduits.

Since trailer parks conform to established lot sizes and locations, Mr. Ward finds prefabrication in his shop the answer to economical and profit-making installations.

This was especially true in one park containing 70 trailer sites, for which the Bradenton electrical contractor also designed and built the sturdy building that houses all the disconnect switching equipment that feeds the underground service system.

Seller and promoter

(Continued from page 35)

train more salesmen to sell the customer at the point of sale.

For two years we have had two sales training courses, one in commercial, institutional, and industrial sales, and one in residential sales. We are now developing a National Sales Training Institute which will be ready by this fall. The institute will be established in Washington and will be an intensive and comprehensive five-day training course for electrical contractor salesmen.

We will ask contractors to send only trainees who will spend the majority of their time selling. This is a "training the trainer" program, where the trainee will take home his training to help train other contractor salesmen.

There are two basic parts to our complete sales training program. The first is the "how to sell" part, and here we cover all of the fundamentals and techniques of creative selling, such as (1) how to survey the market, (2) how to get

leads, (3) how to arouse the customer's interest, (4) how to sell benefits, (5) how to handle objections, and (6) how to close the sale.

The second part of our sales training program is "what to sell" and here we describe the potential markets in (1) lighting, (2) heating, (3) modernization, (4) maintenance, (5) electronics, and (6) Housepower.

We will give the trainee a complete, detailed sales plan for each market. We will advise our newly trained salesman to pick only one, or at the most two, of these markets and rifle-shot his sales efforts rather than shot-gun scatter them over all of these markets. The sales plan we give him will be his sales bullet.

We know that the sales training institute is not going to do the whole job for us—it's only the start of our long-range program. So we will condense the institute down to a two-day sales training workshop and take it to the local level to get it to the smallest as well as to the largest contractor.

Our previous experience in business management workshops indicates a high interest level and a keen active participation by all contractors.

Our present sales training courses will be further promoted to give sales training in depth at the local level.

Our biggest problem is how to stimulate and motivate contractors to become more interested in selling and this is where we need help from the rest of the industry team. For many years we have promoted any industry program in which the electrical contractor is given an active part.

We will continue to do this. This is why we are keenly interested in the wiring bureau's sales training workshop and why we are helping to sponsor and promote it. We need it to stimulate and motivate contractors to do more selling.

We also need cooperation from our fellow teammates to help motivate the electrical contractor to do some selling himself and to help him find a full-time salesman. Once he finds a salesman, we will help to train that salesman.

We need your help to convince him that he must invest in his own business and that he must spend money to make money and that he must budget a year's sales expense for a full-time salesman.

Please note that we have included Housepower as one of our major markets. We feel that electric heat when combined with Housepower will make the residential market extremely attractive to all electrical contractors. Instead of a $300 or $400 installation we now have a potential sale of from $800 to $1,500 per house!

We will do our utmost to sell electric heat as a part of Housepower but only in those areas where our utility partners feel that it is desirable for us to do so. Here we need to give as well as to receive the greatest teamwork, particularly to and from our utility partners. We ask them and we ask you to deal with responsible, reputable, reliable, qualified contractors who will stand behind their work by guaranteeing their installations for at least one year.

Let's sell ourselves first on the benefits of living better electrically and then let's work together as a team to sell the public.

Home show exhibit

(Continued from page 35)

Public Service advertising on Full Housepower comprised 15 newspaper insertions, and use of radio and television.

During 1961 a Housepower exhibit is scheduled for the Home and Garden Show in May.

During the latter part of 1961 a house-to-house canvass will be started to discuss Housepower with the residents of a selected section of New Orleans.

Almost 10,000 lines of Housepower newspaper advertising plus television and radio spots are scheduled for 1961.

Housepower promotion

(Continued from page 33)

any ads or radio scripts containing brand names or non-service features.

We announced this plan to contractors in December, 1959, by a letter setting forth the regulations governing the plan, and enclosing a commitment form. We requested the contractor to return the form to us promptly, stating the approximate amount of money he intended to spend for Housepower advertising during the year 1960.

Space was provided on the commitment form for the contractor to designate in what papers, or over what radio stations, he planned to advertise. After we received this commitment form from all contractors who desired to participate in the program, we let each contractor know the amount

T. M. ®

"SNAPER" STRAPS

T. M.®

FOR THIN WALL & RIGID CONDUIT

THE SNAPPER

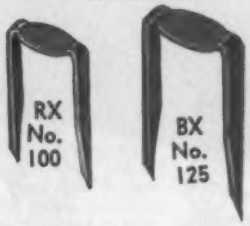
SNAP ON - STAY ON

THE STANDARD . . .

. . . THE ORIGINAL

"NOB" STAPLES

T. M.®



There is a difference — Why take less!

W. W. CROSS & CO.

JAFFREY, N. H.

FASTENERS SINCE 1869

General Sales Agents

J. J. WALSH COMPANY

GREENVILLE, R. I.

For more details on above items, use reply card on page 27

of money that would be available to him in 1960 on a 50-50 basis.

Throughout the year, we watched the program carefully to determine how much money was actually being spent by each contractor. At the end of six months, we got in touch with each contractor to determine what his plans were for the balance of the year.

If he did not plan to use the full amount of the money originally authorized, this money was reallocated to other contractors who would use it. This method of operation worked very well.

In general, the rules governing this cooperative advertising plan were these:

(1) All advertising had to be devoted exclusively to wiring and contractor services.

(2) Each printed ad had to contain the Housepower symbol—"Is Your Home Wired for Full Housepower?" All radio scripts had to be approved in advance by the Electric Institute of Washington.

(3) Co-op funds were available only for space costs. No art charges, mechanical charges, or other non-space charges were honored for reimbursement.

(4) All advertising space had to be in approved newspapers and magazines, and not in ad books, programs, and so on.

(5) Reimbursement was made to the contractor after he had paid his bill, and submitted to us the receipted bill and a tear sheet of the ad.

At the close of the year, our industry coordinator called on each of our electrical contractor members and asked, "How many jobs did you do this past year, which you feel were traceable to our Housepower advertising campaign —and that required an increase in the size of the existing service entrance equipment?"

The number of such jobs, we found, totaled 7,459. The dollar value of the jobs amounted to $945,295. The average cost of each job was $127.

We discovered a number of other interesting things by talking with our members. We learned, for instance, that people are becoming increasingly conscious of the term, "Full Housepower," and of its meaning in relation to modern and efficient homes.

We learned from our contractor members that customers are buying larger service entrance equipment than they used to, in order to allow for future service needs.

Also, contractors report favorable reaction from retailers who have traced appliance sales to the additional wiring capacity.

Housepower acceptance

(Continued from page 33)

forts to stimulate greater public confidence in the contractor are now becoming successful.

An attention-getting display at the Maryland State Fair was the Housepower Information Center, which consisted of a modern entrance system, with a circuit breaker distribution panel. Leading from the panel were the various circuits which would be installed throughout a house.

These circuits were labeled as to their use and wire size, and were equipped with the proper type of outlet, a switch or fixture. The equipment was mounted on a board simulating a house, and was manned by a Housepower speccialist.

Over 73,000 adults visited the mobile "Carnival of Living" which contained a modern kitchen, displays of Housepower, electric heating, and Light for Living. This unit was located at fairs, carnivals, shopping centers, and small towns throughout the service area.

Sales aids such as consumer literature, contractor truck signs, job identifying lawn signs, pocket protectors, school book covers, pencils, matches, and similar materials stimulated many wiring inquiries.

Concentrated mailing campaigns, offering free light bulbs for the privilege of conducting a wiring survey, were productive in acquiring prospects. Many of these leads resulted in Housepower installations. A bonus plan provided a $5 award for leads resulting in sales.

A total of 3,347 requests for surveys were received, and a better than 30 per cent sales average was maintained by sales estimators.

Mr. Carr states, "Our Housepower financing facilities remain the foundation of the program, and one of the most deciding factors in its success."

A maximum of $300 can be financed for 12, 24, or 36 months. No down payment is required and terms as low as $2 per month can be paid on a customer's electric service bill.

An eight-week course for elec-

NEW EDITION

ELECTRICAL ESTIMATING GUIDE

Covers Over 2000 Wiring Jobs

This new, entirely different estimating guide has 200 completely worked out charts.

Authentic, Time Saving—Easy to Use

This book is easy to use—it has no complicated mathematics or formulas to work over. You merely determine the nature of the wiring, check it in the BLUE BOOK OF ELECTRICAL ESTIMATING and there's your answer—it's the simplest estimating book ever written.

7 DAYS FREE TRIAL

This book was written by a successful electrical contractor and estimating engineer with over 20 years' experience. It has an entirely different method of determining estimates on wiring jobs. Electrical contractors, journeymen, architects, and engineers will find use for this book every day. Gives time required to do jobs along with complete labor charges in every state in the country. Check the PRODUCTIVITY of your men with this authentic, field tested book. Order this book now from your supplier at special introductory price of $8.25 or send coupon below.

ESTIMATING HANDBOOKS ASSOCIATES — 5848 N. LEONARD AVE., CHICAGO 30, ILL.

Send me the NEW BLUE BOOK OF ELECTRICAL ESTIMATING for 7 days free trial. I understand I may return the book within 7 days and owe nothing. If I keep it I will pay $8.25 plus postage for shipping.

NAME

ADDRESS

TOWN ZONE STATE

☐ I enclose $8.25 to save shipping cost.

☐ Send C.O.D. I'll pay postman $8.25 plus C.O.D. fee on delivery.

(April 1961)

trical contractors and their trade allies was conducted to promote electric heating.

Economic comment

(Continued from page 4)

On the other hand, there may be strong psychological implications at work, and the average car buyer may be reluctant to go into installment financing until he is certain of improving economic conditions. It would appear that this is a much stronger argument than that of poor weather conditions.

There is no doubt that the individual who refuses indebtedness until he is certain of the ability to repay is economically smart. However, there is ample reason to believe that much of the fear of economic recession may be politically motivated rather than caused by basic weakness in the economy.

If this is so, those who cry recession may be the cause of the problem that they decry.

Wiring workshop

(Continued from page 31)

paign was described by Sydney C. Blumenthal, Jr., president of Blumenthal-Kahn Electric Co., Baltimore, and chairman of NWB's Commercial Task Group.

The ad campaign comprises four different, full-page, black and white ads in three publications: *Business Week*, *Nation's Business*, and *Today's Business*.

Mr. Blumenthal explained the creative, well-conceived approach to the businessman to stimulate his thinking in terms of electricity to do the job better. The ads feature the Keep Pace Electrically emblem.

Again the meeting provided the backdrop for the annual *Look* Magazine awards to winners of the seventh Annual Residential Wiring Promotion Competition.

Trophies and plaques in five categories went to utilities, contractors, distributors, and leagues.

"Oscars" went to R. C. Electric Co., electrical contractor, Milwaukee; Farell-Argast Electric Co., distributor, Indianapolis; the Electric Institute of Washington, D. C., league; and Pennsylvania Power & Light Co., Allentown, Pa., Alabama Power Co., Birmingham, and Dayton Power & Light Co.

Special citations went to K. J. Kenny Co., Mineola, N. Y.; Reddy Electric Co., Louisville, Ky., and Morris Electric, Levittown, Pa., all contractors; Howland Electric Wholesale Co., El Monte, Calif., distributor; the Electrical Construction Industry Council, San Jose, Calif., league; Niagara-Mohawk Power Corp., Albany, N. Y., and Kentucky Utilities Co., Lexington, Ky.

The awards were presented by Fred Bauer, vice-president and Western advertising manager of *Look* in Chicago.

Outstanding local promotions included a presentation by J. A. Morrison, managing director of the Electrical Association of Philadelphia, describing a very successful approach to helping contractors work in the commercial wiring modernization field.

And in the residential market, William G. Hills, managing director of the Electric Institute of Washington, D. C., told how their cooperative effort among all branches of the electrical industry brought maximum effectiveness to national and local Housepower advertising.

Three electrical contractors, from different parts of the nation, explained how they tackled the wiring promotion problem.

Emmett Pritchett, of R. C. Electric, Milwaukee, winner for the second consecutive year of the *Look* "Oscar" for electrical contractors, described their promotion-minded operation in the field of residential wiring.

G. B. Thornton, president of Thornton Electric, Niles, Mich., spoke about their successful and profitable electric heating and insulation business. The company increased its business 78 per cent since entering into the electric heat field.

Over 400 installations, a large portion of which were existing home conversions, give the company an excellent base of satisfied users for referral purposes. Mr. Thornton described their close cooperation with the local utility, their distributor, and their consistent working with one quality well-known brand name of electric heating equipment.

Another contractor, William N. Collins, of Collins Electrical Construction Co., St. Paul, Minn., described an effective method of developing new business in the commercial wiring modernization market.

Commercial lighting, he said, is one of their best markets, limited only by "the limit of one's imagination." Their promotion is supported by market surveys, and they are constantly looking for creative ways to sell the customer

SNAP!
THEY STAY ON.....
All VICTOR "MAGIC" CLAMPS and STRAPS for Thin and Heavy Wall Conduits have this time-saving snap-on feature.
Contractors everywhere are switching to VICTOR. Cash in on this heavy demand. Add these fast selling, profitable Clamps and Straps to your line.
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beneficial new products and new applications.

He pointed to the field of lighting in night clubs as a particularly profitable one and one in which creative selling could be accomplished without the impedance of competitive bidding.

The second day of the conference was devoted to three open-forum discussions—one on commercial wiring modernization, one on residential wiring modernization, and one on the Medallion Home program.

The conference concluded with luncheon speaker Harold A. Webster, president of the National Electrical Contractors Association and president of T. Frederick Jackson Co., Inc., Long Island City, N. Y., urging all segments of the industry to work together in the interests of the public, the industry, and toward realistic goals of progress and sensible profits.

Washington report

(Continued from page 7)

ment is sponsoring 20-hour basic training courses for apprentice instructors. The instructors take lessons applicable to the subjects they teach.

Instructors are then supposed to train the company supervisory personnel, the journeymen who supervise apprentices on the job, and apprentices.

Information may be obtained from the Bureau of Apprenticeship and Training, Department of Labor, Washington 25, D.C.

Unsafe work clothes cause many accidents

SECOND GREATEST CAUSE of accidents in one industry is unsafe work clothes, according to Joseph Kirshbaum, president, Institute of Industrial Launderers, Inc.

Trousers with cuffs catch on projections, and trip workmen. Unlaundered work clothes irritate and infect the skin. Rips, tears, and lost buttons leave loose ends that catch on moving parts and projections.

Mr. Kirshbaum says that street clothing is ill-designed for on-the-job work. A neat, clean uniform is far less likely to be an accident hazard. Eliminate cuffs, loose and dangling sleeves, floppy pocket flaps, loose apron strings, and the like, he advises. Weak spots and places that get the most wear should be strongly reinforced in uniforms.

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For direct factory representation, contact Ralph Y. Morgan (2501 Columbia Drive, Decatur, Georgia; BUtler 9-3224). Available now. Formerly Division Manager for Economy Fuse & Manufacturing Company, supervising sales in 9 Southeastern states. Has wide contacts, with Distributors, Contractors and Users.

KEEP UP-TO-DATE USE ELECTRICAL SOUTH'S READER SERVICE SEE PAGE 27

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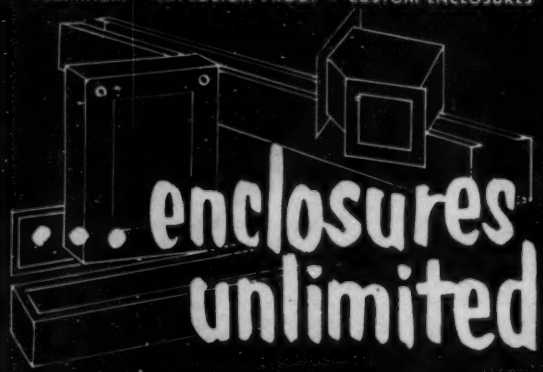

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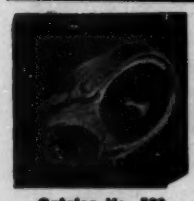
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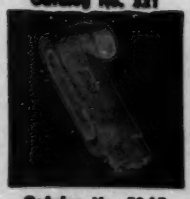
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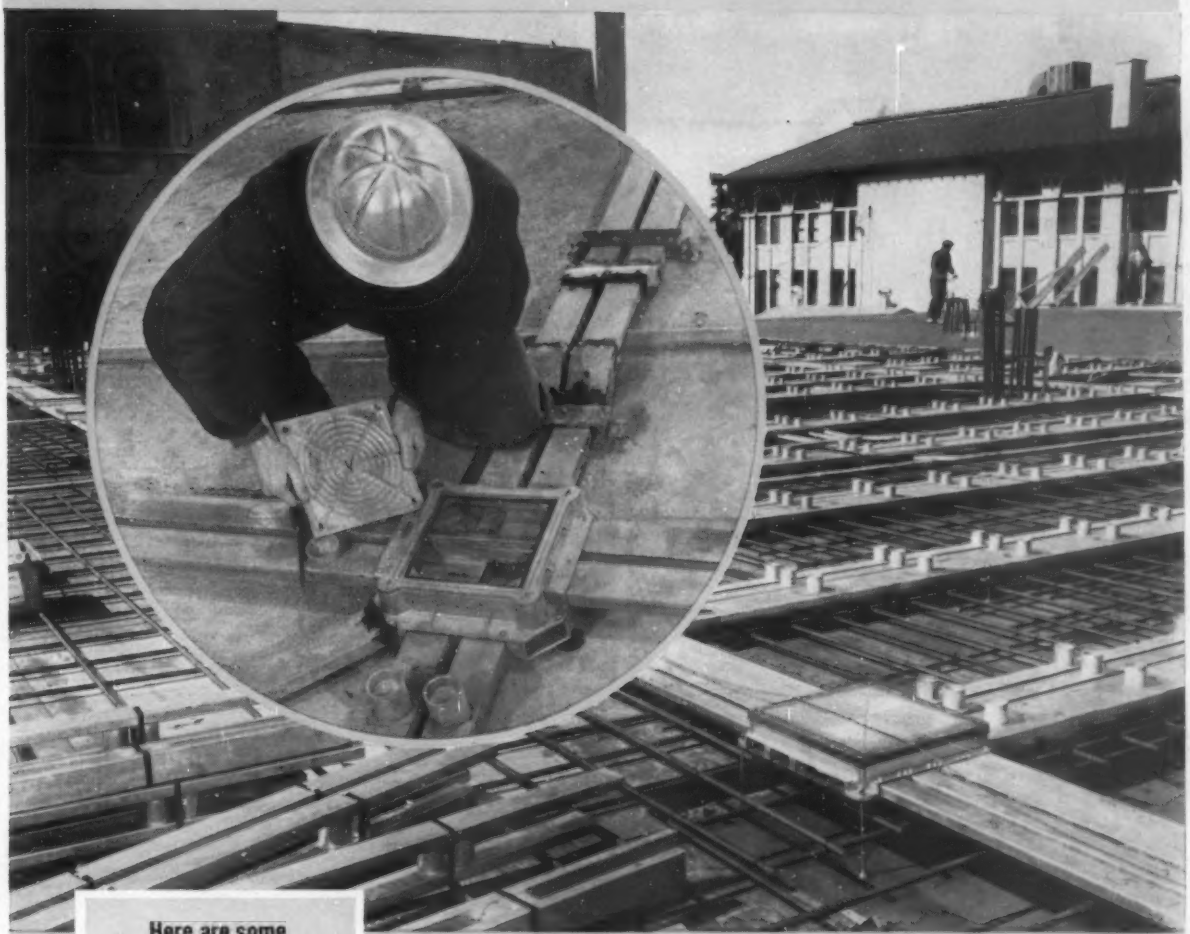

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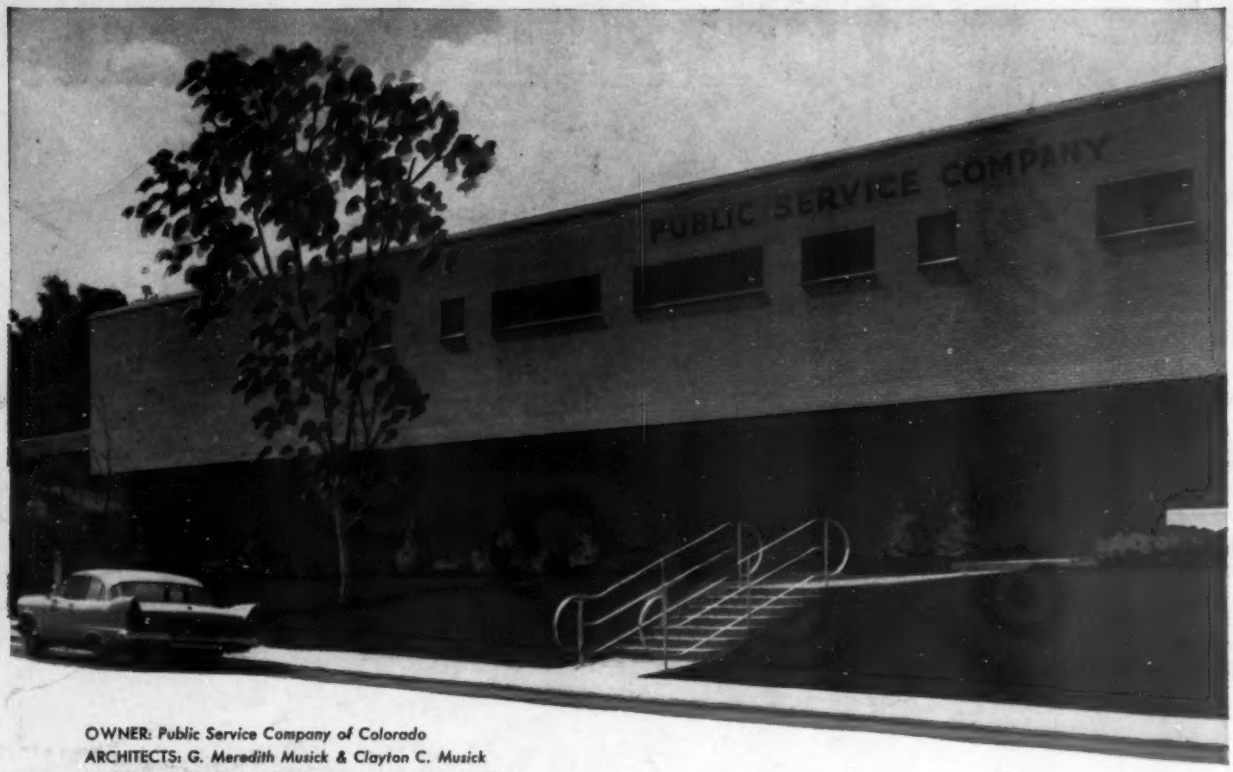

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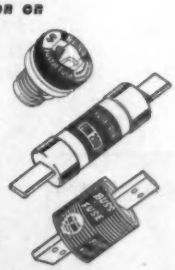

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